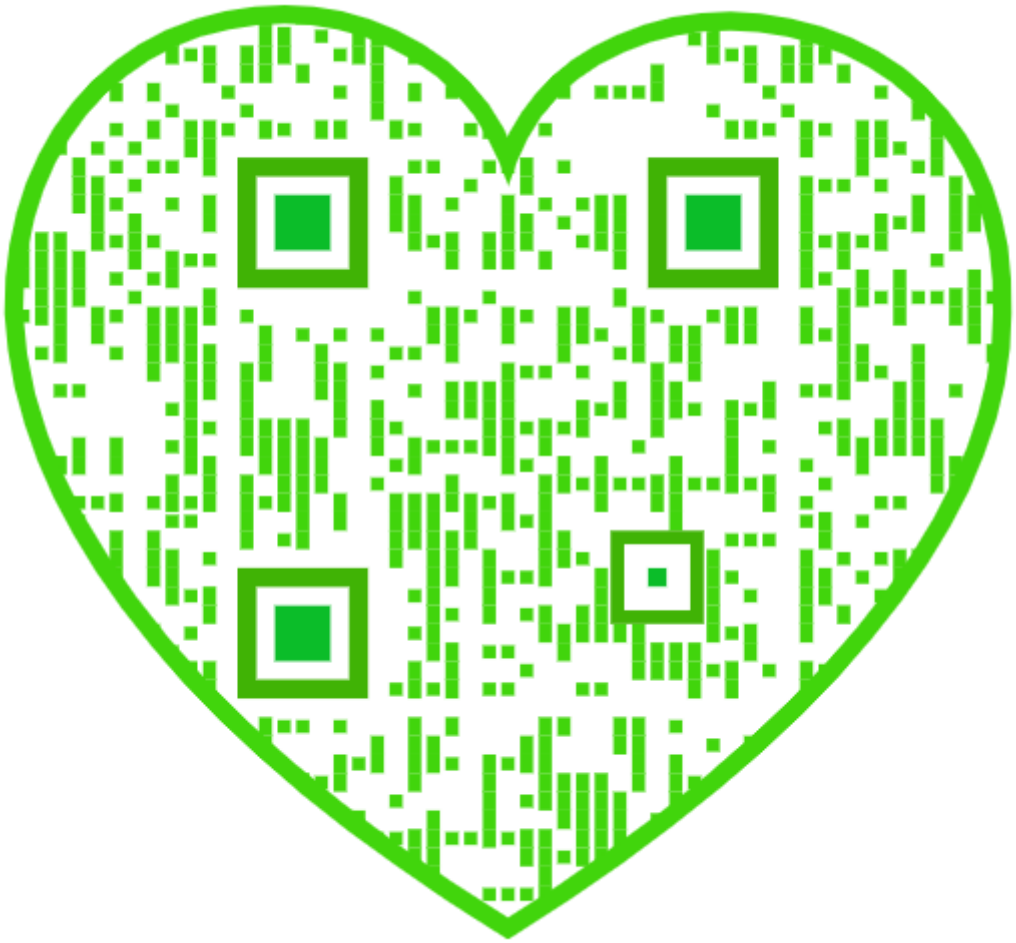
UC-NRLF
$C 24 905

CAST IRON PIPE



LIBRARY
OF THE
UNIVERSITY OF CALIFORNIA.
GIFT OF
C. Derleth
Class

UNITED STATES CAST IRON PIPE AND FOUNDRY COMPANY

23 1907

CAST IRON PIPE

SOME NOTES AND TABLES

Standard Specifications
Dimensions and Weights

of CAST IRON BELL AND SPIGOT PIPE
AND SPECIAL CASTINGS *for* WATER,
GAS, SEWAGE, CULVERTS, DRAINS, ETC.
IN ALL REGULAR SIZES, 3-INCH TO 84-INCH,
FLANGE PIPE AND SPECIAL CASTINGS,
FLEXIBLE JOINT PIPE, LOAM CASTINGS
HEAVY SPECIAL CASTINGS

LIBRARY
OF THE
UNIVERSITY
OF
CALIFORNIA

1906

MANUFACTURED BY

United States Cast Iron Pipe & Foundry Co.

NEW YORK PHILADELPHIA PITTSBURGH
CHICAGO CHATTANOOGA SAN FRANCISCO

TD491
.U5

Duff
Duluth

Copyright 1906 by
United States Cast Iron Pipe and Foundry Company

United States Cast Iron Pipe & Foundry Co.

Works at

Addyston, Ohio	Buffalo, N. Y.	Columbus, Ohio
Anniston, Ala.	Burlington, N. J.	Louisville, Ky.
Bessemer, Ala.	Chattanooga, Tenn.	Newport, Ky.
Bridgeport, Ala.	Cleveland, Ohio	Scottdale, Pa.
South Pittsburgh, Tenn.		Superior, Wis.

THESE fourteen plants of the United States Cast Iron Pipe and Foundry Company afford a large annual capacity, and make it possible for the Company to handle the largest contracts with promptness and most effectively. As pipe and special castings of our standard dimensions and of given diameter and class are interchangeable, it is possible when essential to ship large orders from two or more works, and in many other ways to facilitate the filling of the largest orders.

All orders and contracts are accepted only as contingent upon strikes, accidents and causes beyond our control. Any casting developing an inherent defect when placed in service, will be replaced f. o. b. at the agreed point of delivery, if within the United States.

While the general offices of the Company are in New York, domestic inquiries should be addressed to the nearest sales office without regard to the point of delivery or works from which shipment may be desired.

Foreign inquiries should be addressed to the New York office.

Foreign shipments invariably cash against shipping documents in New York or London.

General Offices : 71 Broadway, New York City

Cable Address, "Uscipipe" New York

Eastern Sales Office	Empire Building, New York
Western Sales Office	638 Rookery, Chicago, Ill.
Southern Sales Office	Chamberlin Building, Chattanooga, Tenn.
Pittsburgh Sales Office	Murtland Building, Pittsburgh, Pa.
Pacific Coast Office	San Francisco, Cal.

LIBRARY OF THE UNIVERSITY OF CALIFORNIA

Introduction

THIS book has been prepared in the hope that it will prove helpful to users of cast iron pipe. The tables cover full lines of standard pipe and special castings, which may be incorporated in plans for new works or extensions to existing plants, thus facilitating the making of estimates, the answering of inquiries and the filling of orders. Attention is directed to the coding for use in telegraphing. Some notes are given on cast iron pipe, forms of joints, main leakage in water and gas works, and regarding high pressure fire lines and other data, as of possible interest to those considering the use of pipe, and some tables have been added which will be helpful in determining pipe sizes and capacities. While we will cheerfully answer inquiries, and there are numerous books on water and gas construction available to those contemplating the building of a new water or gas works, we strongly urge that any important pipe installation should be laid down under the direction of a competent engineer.

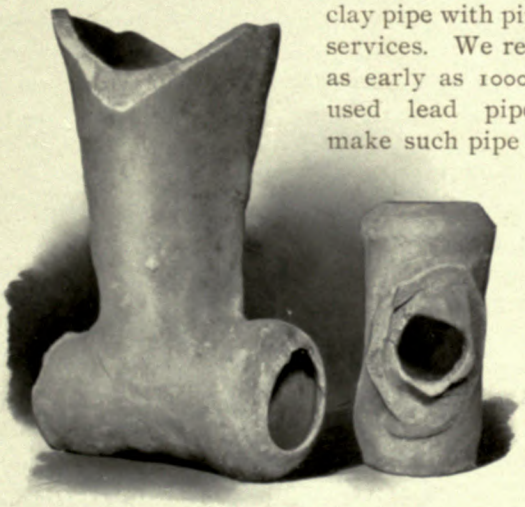
UNITED STATES CAST IRON PIPE AND FOUNDRY CO.

July, 1906

Cast Iron Pipe

Iron and other metals were known to man in prehistoric times. Numerous references in tomb records show early knowledge of gold, silver, copper and lead, if not of iron, used in Egypt to a limited extent even in the predynastic age. Probably one of the earliest references to iron is in the record of "Tubal-Cain, an instructor of every artificer in brass and iron," (3874 B. C.)* and whose name, by the way, is a bit suggestive to a maker of pipe. As the world progressed, iron is more frequently mentioned; for instance, as tribute received by the Chinese, and as used by the Israelites 2000 to 1500 B. C., and later, in the centuries preceding the Christian era, by the Phœnicians, Greeks and Romans. A fable tells us that Juno was hung from the sky, with iron anvils fastened to her feet, and that Vulcan "fell all day to Lemnos," we do not know how many ages ago. Archæologists have uncovered much to show that the early Egyptians and Assyrians were skilled metal workers, but not as makers of iron pipe.

Earliest Pipe. In the excavations of the Temple of Bel, at Nippur, Babylonia, Prof. Hilprecht found clay pipe,† which from their location must date from more than four thousand years B. C. He tells us "directly beneath the ancient inclosing wall opened a vault about 1 m. high, built in the form of an arch. It belongs without doubt to the fifth millennium. * * * In the 'Kingdom of Nimrod' it was not necessary to tear up the pavements whenever an underground pipe burst, for this structure is not a mere subterranean canal for drainage, but an arched passage, in the bottom of which are imbedded in cement, * * * two clay pipes of about 15 c. m. diameter, alongside each other. If one of them burst, a workman crept into the vault and repaired the damage without further difficulty. * * * About 500 knee and T joints found in the vicinity show us that even at that early time they understood how to unite pipe meeting at right angles." Here we have reference to the earliest known Babylonian arch, and undoubtedly to the earliest pipe and specials known to us to-day. From the fact that such pipe and specials were used at that time, it would seem probable that the expert metal workers of those early days soon supplemented clay pipe with pipe of lead, and even of copper or brass for important services. We read of "cast pillars of brass" and "molten brass,"‡ as early as 1000 B. C. We know that the Greeks and Romans used lead pipe extensively, but the knowledge of how to make such pipe probably came down to them from the Phœnicians or Egyptians of earlier times. The Delhi Lâht, or huge iron pillar, and iron beams used in the construction of temples and palaces in India, and massive iron girders found in ruins at Rome, testify to the existence, several centuries B. C., (though the Lâht may be of a later period) of great iron works in India and in Spain. Their product seems to have been entirely of wrought iron and steel, but apparently did not include pipe. Among the bloomeries of early times we do not find any with a pipe foundry annex. Iron



Knee and T Joints
Made about 4,000 B. C. Found in the excavations of the Temple of Bel, at Nippur, Babylonia

* Gen. iv, 22. † Hilprecht, in the Temple of Bel, at Nippur.
‡ I Kings, vii, 15-16.

castings, or rather "fused iron forms," Aristotle (359 B. C.) tells us, were not then commercially made, and indeed until five or six centuries ago were apparently scarcely known at all. In these days of iron and steel, with all our hurry and pressing demands, we seldom stop to think of the wonders wrought two, three and even four thousand years before Christ, or to credit the civilization and culture of the people of those far away days, with certain influences felt to-day.

Water Supply Conduits. Probably the earliest artificial conduits were the canals and other surface waterways of comparatively level ancient Egypt and Babylonia. Some of them were large undertakings, but especially in Egypt were constructed with a view mainly to irrigation and also for navigation, rather than as conduits of water for domestic supply. The early Egyptians were famous for their dams, dikes and canals, and for their ingenious though primitive methods of raising water. They made brick and built treasure cities, and, as suggested, probably made pipe of baked clay, but we read of wells and water jars rather than of pipe. Memphis and Thebes had the Nile, but what of the distribution of their domestic water supply? Glancing farther east, on the site of old Jericho may be traced several conduits and a reservoir. Damascus, that city without a known date, early had its conduits. At Jerusalem, about 1000 B. C., King Solomon built aqueducts. We also read that the good King Hezekiah, 717 B. C., "made a pool and a conduit and brought water into the city."* According to Dr. Bertholet of the University of Basle, this is now confirmed by an old manuscript of that period, recently discovered, which translated, reads: "Hezekiah fortified his city by bringing water thereto, and he bored through the solid rock by means of bronze, and he collected the water in a reservoir;" no mention is made of pipe. Within the past few years the tunnel has been identified, and pick marks indicate it was bored from both ends—an interesting bit of early engineering. Babylon (about 580 B. C.) had its great reservoir, canals and hanging gardens, but we find little to indicate how the water was distributed. Probably even earlier was built the great aqueduct at Carthage, some fifty miles in length. Its route may be partly traced to-day but the history of Carthage,† like that of most cities of the time, lacks definiteness as to water supply distribution. Water brought by these conduits to these ancient cities must have been more or less distributed to public pools and fountains, and probably to important buildings, palaces and temples, and as the world progressed, clay and lead pipe were more freely availed of. Thus we read that about 600 B. C. the Greeks were building waterworks, using for distribution clay and lead pipe.

An Old Roman Aqueduct

The Romans, too, had famous aqueducts; Rome some fourteen of them, aggregating about 359 miles in length, of which 304 were underground conduits, and 55 above ground. The Aqua Appia dates from the time of the Censor Appius Cœcus Claudius (312–304 B. C.). The others seem to have been constructed in the intervening period up to around the beginning of the Christian era. The two largest, Claudia and Anio Novus, 45 and 62 miles in length respectively, were built in 38 to 48 A. D. Their routes joined about six miles from Rome and thence

* II Kings, xx, 20. † 850–150 B. C.

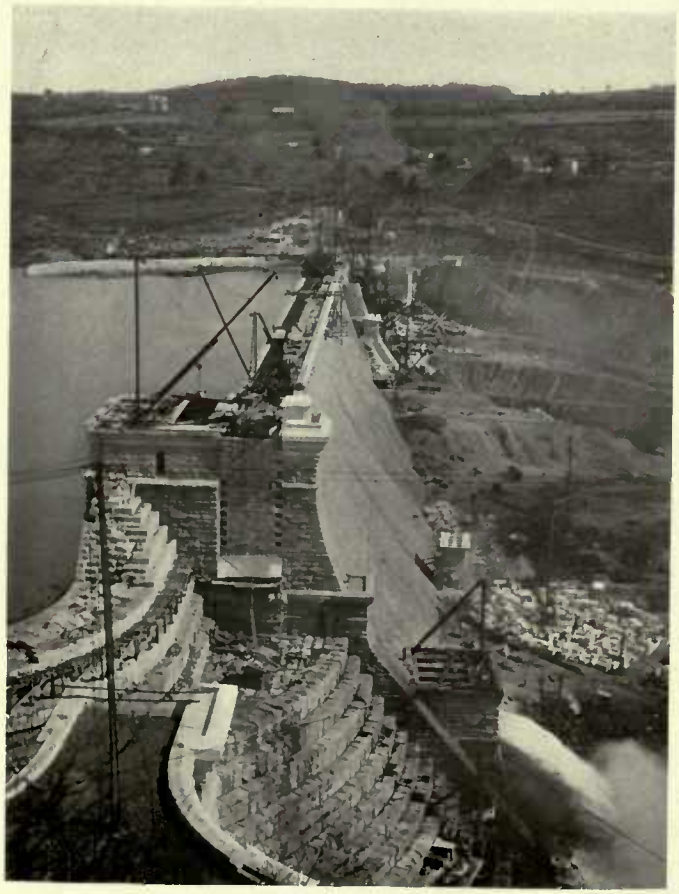
there were two separate channels, one above the other, supported on arches, which at one point rise 109 feet in height.

Lead Pipe. Of the Aqua Virgo it is recorded, "the water was conveyed in pipe, partly under and partly above ground, on a solid substructure or on arches." This reference to pipe is probably to lead pipe, which were evidently preferred for lines under more or less pressure, for lead pipe were used "in crossing valleys," "laid according to the slope of the hill," down to "a long level, then up," with intermediate standpipe or venters. According to Vitruvius* (about 25 B. C.), such lead pipe were made "in lengths of not less than 10 feet," and "take the names of their sizes from the quantity of the inches in the width of the sheets before they are bent round; thus, if the sheet be 50 inches wide before bending into a pipe, it is called a 50-inch pipe; and so of the rest." Vitruvius gives a list of ten sizes ranging from 100 inches, weighing 1,200 pounds, to 5 inches wide weighing 60 pounds per length. The pipe were probably soldered with an alloy of lead and tin. Lead pipe were also used for distribution, as to some extent were clay pipe "tongued at one end." The aqueducts supplied the baths and numerous large public fountains, from which last the people obtained their water, except such as could afford to pay for a separate pipe to their houses, and these latter were a source of considerable revenue. Vitruvius also notes injurious results from the use of lead pipe, adding "water should therefore on no account be conducted in lead pipe, if we are desirous that it should be wholesome." The excavations at Pompeii, which was destroyed by the great eruption of Vesuvius, 79 A. D., have revealed numerous fountains, and two thermæ or public baths which were supplied with water through lead pipe from reservoirs much as were the famous baths of Caracalla and other thermæ in Rome. Lead pipe as used by the Greeks and Romans were common enough in those days and probably for several centuries preceding the Christian era but we find no mention of iron pipe.

Aqueducts. The term "aqueduct" was applied to the conduit as a whole, comparatively a small portion of which was carried on the arched masonry structures we are prone to think of as aqueducts, and it is interesting to note how at that early period these waterways were built so much of their length underground. Their grades (Vitruvius suggests "a fall of not less than one half a foot to a length of one hundred") were so adjusted that the water flowed by gravity without undue velocity, as much in vented tunnels or conduits as possible, and thus often wide detours were made. For instance, the Aqua Claudia starts at a point thirty-five miles from Rome, and winds its way, a distance of forty-five miles, to the city. The conduits were lined with some material impervious to water, and in section varied with location. Tunnels were ventilated by vertical shafts, and usually the valleys were crossed with arched structures. To some extent the Romans may have copied the Greeks, who apparently did not use the arched masonry aqueduct, at least until much later, but carried their vented conduits through hills into valleys under streams and, to supply Syracuse, even under the sea. Considering the material available these underground conduits are remarkable, and as some must have been under considerable pressure it is probable early Greek engineers had "troubles of their own" causing the Romans to adopt the arched masonry aqueduct. On the other hand, possibly Greek engineers were not then well versed in arch building. Be this as it may, it is hard to realize that anything with which we are so familiar as the arch, or water works, or even cast iron pipe, were at any time novelties and really had their day of invention and introduction. There is no telling what early Greek and Roman engineers would have done could they have had cast iron pipe as we have them.

* The Architecture of Marcus Vitruvius Pollio. Trans. Gwilt. Specimens of ancient lead pipe are to be found in most museums.

That in those far off days they were able to accomplish so much is surprising, and it must have cost much in labor and patience. Think of driving a tunnel through rock without the appliances we have available to-day; and yet the water supply of Athens* was obtained through three underground conduits mainly cut through rock, two of them passing under the bed of the river Illissus. These brought water to a reservoir outside the city from which it was distributed in underground channels of various forms and partly through pipe of baked clay and through lead pipe. Thus Athens early enjoyed its baths, fountains and public water supply, but the quite wonderful aqueducts of the Romans, and those later built in France and other countries, are the most notable monuments to early water works engineers. One of the most beautiful later structures, dating from the seventh or eighth century, is the aqueduct Delle Torré, near Spoleto, Italy, with its ten graceful pointed arches of 66 feet span, and nearly 300 feet in height, and which, restored, is in use to-day. Paris, London and Vienna, reaching back into the Roman period, and Berlin and other cities of more recent date, have each included in their development various water supply problems. Aqueducts, conduits, cisterns, reservoirs and fountains, with clay and lead pipe, (and later bored logs) seem to have been in general use, and in the early days of Athens and of Rome we read of much that is interesting and curious, but we must pass over these intervening centuries to the time we first hear of cast iron pipe.



Croton Dam Nearing Completion, 1905†

Castings of Iron. Not until the fourteenth or the fifteenth and sixteenth centuries are castings of iron really mentioned. In the latter, cast iron cannon were made. Naturally not long afterward cast iron pipe were produced and we hear of them early in the seventeenth century. In 1720 it was said "there is not a street in London but water runs through it in pipe, conveyed underground," and while the kind of pipe is not specified, they were probably, in part, of cast iron, as such pipe had been used in France in the preceding century. Since 1700 we find their use constantly increasing and in the last century they play an important part in the makeup of most conduits and aqueducts, to say nothing of mains for distribution.

Modern Conduits and Reservoirs with Cast Iron Pipe. The canal, with its forty-five tunnels and numerous aqueducts, which brings water some sixty miles to supply

* 560 B. C.

† Photograph by Pullis, New York, 1905.

Marseilles, and the old Croton Aqueduct, with its conduits, tunnels and splendid stone arched bridge carrying cast iron pipe over the Harlem River, and which conveys water some thirty-four miles to New York, are examples of comparatively modern aqueducts, both having been completed about 1842. Since then the development of the Croton water supply has gone on apace, with its well-known reservoirs, conduits and piping; one set of the latter comprises eight lines of 48-inch cast iron bell and spigot pipe laid in one trench, which lead from the 135th Street Gate House. Here also terminates the new Croton Aqueduct, completed in 1890, which is nearly thirty-one miles long, almost entirely in deep rock tunnels, only a little over a mile being in trench or on embankment. The new Croton dam, now about completed, is the highest and largest reservoir dam in the world, and contains 850,000 cubic yards of masonry. The new Croton reservoir is nearly twenty miles long, and there are nearly seventy-five miles of stone walls surrounding the land required for it. When full, the old Croton dam about three miles above will be submerged to a depth of 34 feet, and the reservoir will contain about 38 billion gallons. This, with the other reservoirs of the Croton watershed, will afford an available capacity of 72 billion gallons, which is barely sufficient for present needs. The proposed new supply for Greater New York, recently authorized, (1905) will probably be taken from Esopus Creek in Ulster County, New York, about ninety miles north of the city, requiring the crossing of the Hudson River by the proposed 500 million gallon tunnel and trench aqueduct. The works will include a 66 billion gallon reservoir with a masonry dam 1,280 feet long and 175 feet high from creek bed.

Gate House and Reservoir Connections

Wachusett Reservoir Dam, 217 Feet High

As we look over the more recent undertakings we find cast iron pipe becoming more and more of a factor, as used for gate houses, reservoir connections, for siphons in crossing valleys, and for supply mains. The new water supply at Manchester, England, for instance, comes largely from the beautiful Lake Thirlmere, a distance of some ninety-six miles, through a modern conduit partly in tunnels and cut and cover channels, while it

Masonry Aqueduct on line from Wachusett Reservoir

dips into valleys and under streams by means of inverted siphons of several lines of 48-inch, 42-inch and 36-inch cast iron pipe some of them subject to a pressure due to more than 400 feet head. Another recent achievement in Scotland is the completion, in September 1905, of the new water supply for Edinburgh. The water is brought some thirty-six miles from Talla in the parish of Tweedsmuir, Peebleshire. The conduit is composed of 23 miles of built tunnel, cut and cover aqueduct, with six siphons each of several lines of 36-inch to 27-inch cast iron pipe, in all 13 miles of line in piping, and the new plant includes a reservoir which when full will contain more than 2½ billion gallons.

60-inch Rosemary Siphon, Wellesley, Mass.

Perhaps the most notable of recent water supply undertakings in the United States is that of the Metropolitan Water and Sewerage Board of Massachusetts, at Boston. This comprises the great Wachusett Reservoir, now finished, covering 7,200 acres, with a capacity of 63 billion gallons, with its massive dam 217 feet in height, containing 280,000 cubic yards of masonry and which, with the Lake Cochituate and eight reservoirs on the Sudbury River, is calculated to be capable of supplying 173,000,000 gallons per day to the nineteen municipalities comprising the Metropolitan Water District. Water is conveyed from the reservoirs to this district, distances of from fifteen to thirty miles, through the Cochituate, Sudbury, Wachusett and Weston Aqueducts the two latter having each a daily capacity of 3 million gallons. These aqueducts are, in general, constructed of masonry covered by earth embankments, but there are 6.6 miles of tunnels, and in several instances the aqueducts cross valleys on masonry arches or by means of pipe siphons.* Water delivered by the aqueducts is distributed to the several cities and towns comprising the Metropolitan Water District by means of 84 miles of cast iron pipe 34 miles of which are 48 inches and 60 inches in diameter.

Double 60-inch Line to Reservoir
Metropolitan Water District, Spot Pond

Connected with the distribution system of the several municipalities, there are in addition 1,423 miles of cast iron pipe in sizes from 4 inches to 48 inches. Several of the pipe lines are carried under navigable

* For this purpose cast iron bell and spigot pipe in sizes up to 84 inches inclusive may now be had.

streams, requiring the use of pipe with flexible joints, the use of coffer dams, or other special methods of pipe laying.*

The present consumption of water in the district supplied, is about 117 million gallons per day, equivalent to 120 gallons per inhabitant. About 25 per cent. of this quantity is delivered by gravity, the remainder being pumped at pumping stations located at the Chestnut Hill Reservoir about five miles from the State House. These stations contain modern pumping engines of the highest efficiency, capable of pumping 171 million gallons of water per day.

Laying Three Lines of 60-inch Pipe Under Charles River, Boston, Using Coffer Dam

Within the limits of the Metropolitan District, which in general includes the cities and towns within ten miles of the State House, there are several distributing reservoirs, the largest of which, Spot Pond, has a capacity of one billion eight hundred million gallons, and is 163 feet above Boston city base, which is substantially low water mark in Boston Harbor. The water supplied to each municipality is measured by means of Venturi meters placed on the connections between the Metropolitan pipe and the pipe of the several cities and towns, fifty-three meters being used for this purpose.

48-inch Line near Philadelphia, laid before New Street fill

The board having charge of the Metropolitan Water Supply, also has charge of the Metropolitan Sewerage Works, and in connection with these works has recently completed the construction of new works for the disposal of a portion of the sewage of the district. In the portion of the system recently built, the sewage is discharged into the ocean through two lines of 60-inch cast iron pipe each extending about a mile from the shore.†

At Philadelphia, the recently completed Torresdale conduit or tunnel which conveys water from the Torresdale filter beds to the Lardner's Point pumping station, is worthy

* Some of these are referred to on another page, under "Submerged Piping."
† For method of laying these pipes, see page 32.

of mention. Here again 60-inch cast iron bell and spigot pipe play an important part in forming the force mains from these pumping stations to Frankford Creek, where the water is delivered to the distribution system, working against a 48-inch relief line to Oak Lane Reservoir. In a recent report by a board of expert engineers, it is suggested that the use of 60-inch cast iron pipe instead of the masonry conduit from filters to pumping station would have been cheaper and preferable. Four lines of 60-inch cast iron pipe lead from the Lardner's Point pumping stations, and were put down after two lines of cast iron piping, 48-inch and 30-inch diameters, under water pressure, had been moved to one side. Some two blocks from the pumping station, three lines of the 60-inch cast iron force mains are led off toward Frankford Creek. The photograph* shows a section of these 60-inch force mains as tested in the open trench, when they were subjected to a pressure of 200 pounds for five hours.

Four Lines of 60-inch Cast Iron Pipe. One 48-inch and one 30-inch Shifted to Left

We have now had a hurried look at some of the waterways and works of earlier times and a closer view of some modern plants. Thus we see engineers using and depending more and more on cast iron pipe, and they are to-day a most important factor in the development of modern water supply. Cast iron pipe have completely changed earlier methods, and made possible the widely extended distribution of water, to say nothing of their use for gas and other well known purposes.

Life. In these days, in selecting pipe for underground service, the engineer naturally turns to cast iron pipe as the most durable. While we do not know when pipe were first cast, there are well authenticated instances of cast iron mains in service to-day, which were laid more than two hundred years ago, and such pipe have now been in general use more than one hundred years. In 1901 at Versailles, France, an officer of this Company saw repairs being made to a line of cast iron pipe leading to one of the palace fountains, which probably had been laid more than two hundred years. It is said that these pipes were put down in 1685. The fracture, due to subsidence, showed inside a clean pipe of good gray iron, but little rusted outside; the natural result with good water and subsoil conditions. In London, the first cast iron pipe we know of for water were put down about the year 1800. The eight London undertakings —the great water companies—are now vested in the "Metropolitan Water Board," and in a recent letter the Chief Engineer,

"Log Pipe." Bored Logs Laid in Philadelphia before 1820

* Page 17.

William B. Bryan, Esq., writes: "As chief engineer, for many years, of the late East London Company, I have had numerous opportunities of seeing old mains that had been in use for ninety years, and which, when taken up, were in perfect condition." In this country cast iron pipe have been used for fully one hundred years. Some of the earlier pipe were imported, but the making of cast iron pipe received early attention, and the industry has now grown to large proportions. In Philadelphia, following the use of bored logs, cast iron pipe were first used about the year 1804, and since 1820 have been exclusively used by the water department. Numerous instances might be cited of pipe in use to-day which were laid more than a century ago, all tending to prove the long life of cast iron underground. Thus, cast iron as a material has long been accepted as the standard for underground mains, and it is not surprising therefore to find cast iron water and gas mains used almost exclusively in the cities and towns of this country and Europe.

Three Lines of 60-inch Cast Iron Pipe

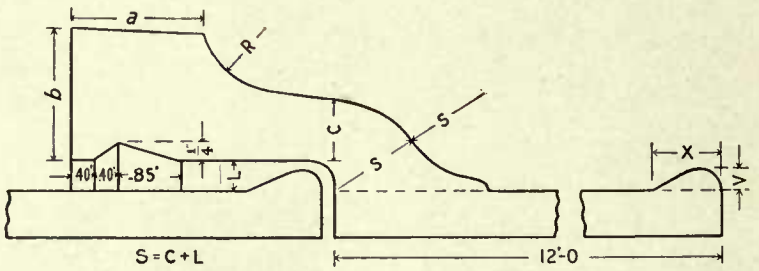
Length. In the early stages of the cast iron pipe industry, short length pipe were made; in France, about 1 meter in length, in England, about 30 inches; then came longer lengths, 6 and 9 feet. The earlier joints were usually flanged, and these being found to be too rigid, were shortly followed by other forms, from some of which were evolved the turned and bored socket and spigot, similar to those to some extent to-day used abroad, and these in turn have been largely superseded by the standard bell and spigot joint calked with lead. Thus experience gained from the earliest days in the making and use of pipe has developed our present lines, as indicated by Standard Specifications herein, which cover pipe cast vertically in dry sand, in lengths to lay 12 feet, with standard forms of bell and spigot.

Dry vs. Green Sand Pipe. In casting pipe vertically in dry sand, the use of core chaplets is avoided, and the 12-foot length insures a much smaller number of joints in the main as compared with short length green sand pipe which are cast on the side, "on the bank," in 9 and 6 feet and even shorter lengths. Aside from the greater number of joints resulting from their use, these green sand pipe are liable to be of uneven thickness, and also to leak through imperfections in the pipe shell, which are due to the process, such as blow holes, or which result from the use of anchors to support the cores in casting on the side. These anchor spots are sometimes concealed by bosses or knobs, which form but a thin covering; thus, covered up, these defects are hard to discover,

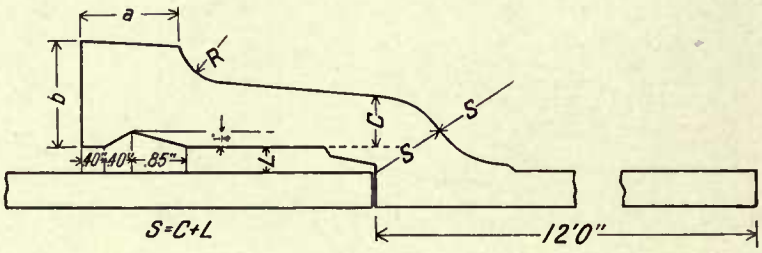
LIBRARY OF THE UNIVERSITY

and often withstand the pressure test, but when buried in the ground will sooner or later develop leaks, or even cause the pipe to break. Such pipe, also, are usually of light weight with thin walls, are illy adapted to permanent mains, and form anything but substantial construction. The thin pipe shell will easily break under shock or subsidence, and the metal in the pipe, because of the process, has a tendency to hardness and brittleness. It is because pipe cast vertically in dry sand are so markedly superior, that this Company long since abandoned the manufacture of green sand pipe.

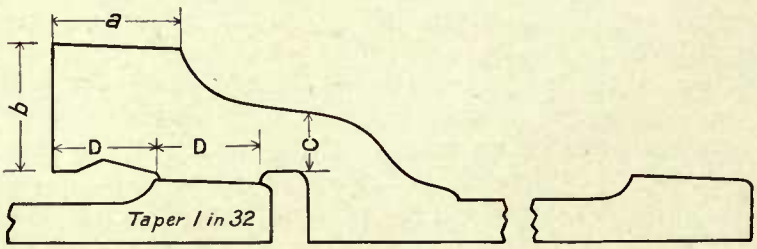
Joints. In the operation of water and gas works, engineers are now more concerned with the question of leakage, and to reduce it, one or another form of joint has been tried, the bell and spigot being that now most generally used. This is because the bell and spigot joint, when well made, is the most flexible, allowing for expansion and contraction without affecting its tightness. Such joints are safely used in high pressure fire line pipe and other hydraulic pressure mains. We also show another type of bell and plain end pipe joint which is made up and calked with lead in the usual way. This design is used abroad and is substantially the same as is required by the Public Works Department of the Netherlands, at The Hague. It is claimed the plain end is more easily centered in the beveled bottom to the bell than is the ordinary spigot, and that the bevel in the bell more satisfactorily makes up with cut pipe. As to the turned spigot and bored bell joint, it is claimed that in being practically a metallic joint it does not leak unless it is broken through subsidence of the ground, or through accident. To allow for expansion and contraction, some engineers for every tenth joint use a socket and spigot calked with lead, while others claim to have no trouble on this account, no doubt because of location. For underground service, a bolted joint whether flange or of other form, should be avoided as too rigid, and because the bolts are liable to rust. An iron to iron joint, whether of conical or ball type, is in no sense a flexible joint, but is liable to rust fast in whatever position it may be laid. There is nothing new in such joints, as certain old French and



Standard Bell and Spigot. (See Table No. 1)



Beveled Bell. The Dutch Type. Plain Spigot



Standard Bored Bell and Turned Spigot. (See Table No. 1)

other patents will testify. If an iron to iron joint is preferred, it should be of the turned and bored type, without bolts.

Making Joints, Bell and Spigot. In laying cast iron pipe having bell and spigot joints calked with lead, care should be taken in making the joint to wrap sufficient yarn around the spigot before entering the bell, then to pack it in with calking tools before running the lead, which should then be well calked up against the yarn. On *well laid* water mains of cast iron, a leaky bell and spigot joint is extremely rare. Some of our friends claim that they do not have any, and recently, an engineer in a prominent Eastern city, advised of having uncovered last year several miles of cast iron bell and spigot water mains without finding a single leaky joint; evidently these lead joints were well made. Note the photograph of a 48-inch cast iron bell and spigot main near Lardner's Point, Philadelphia, as under pressure it was being shifted to one side, and afterward raised onto the ledge. To do this was a severe test of the bell and spigot joint, as to flexibleness and tightness.

Pouring a Lead Joint

Bell and Spigot Joints, in which, instead of lead, the socket in the bottom and annular space surrounding the spigot is filled with wood and carefully calked, have proven tight, and are thought to so insulate the joint as to materially lessen, if not prevent electrolysis. It is too soon to speak of this assuredly but encouraging results are said to have been obtained within the past year with joints so made.

48-inch Cast Iron Main moved while under Pressure
See also Cut on Page 18 showing Pipe after Shifting

Turned and Bored Joints for water or gas pipe, as used abroad, are rapidly laid and are perhaps more extensively used for water than for gas. This general type of joint is still exclusively used in many prominent foreign plants, while it is scarcely used at all in the United States. We again quote from another recent letter from William B. Bryan, Esq., Chief Engineer, Metropolitan Water Board, London: "In my own practice I have used immense quantities of turned and bored pipe, and I certainly think that these pipe, where streets are straight and there are no obstructions to cause deviations, have very great advantages. The greasing of the joints and placing them gently into the sockets of the next pipe, and centering them perfectly, makes a joint which is practically water tight of itself, but in all cases the socket is run with molten lead and set up in the usual manner." In making joints for gas, red lead or sal ammoniac is used and the pipe driven

together, in some instances, without running in the lead and calking; but where this is done the joint is so designed, that in case of a leak it may readily be calked with lead or made good with cement. With turned and bored pipe we supply special castings of our standard dimensions, with bored bells all around. While without the use of special curves the turned and bored joint pipe may only be laid in straight lines, very often long or easy curves are made in lines of full length bell and spigot pipe. An instance of this is shown in the photograph. A slight adjustment in the bell when laying is possible in the standard bell and spigot joint.

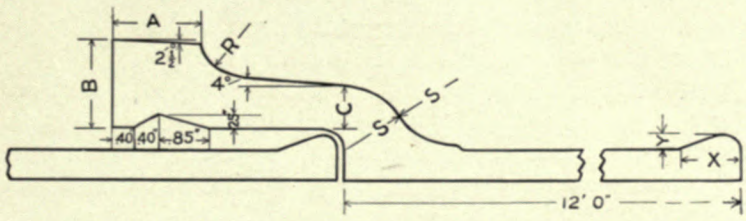
Leakage. Excessive leakage is often wrongly charged to the bell and spigot joint. In a widely quoted "Report on the Measurement, Consumption and Waste of Water Supplied to the Metropolitan Water District," (1904) by Dexter Brackett, Esq., Engineer of the Distribution Department, Metropolitan Water Works, Boston, the causes of waste are clearly set forth, but nowhere therein is the bell and spigot joint complained of. It is stated: "Water is wasted, either negligently or wilfully, from mains and service pipe in the public streets, or from pipe and fixtures on the premises of the water takers;" and it is pointed out that the amount of such waste from street mains and service pipe is a much larger percentage of the total consumption than is generally estimated. In this report it is further stated: "In the Metropolitan Water District there are 1,457 miles of pipe, on which there are 750,000 leaded joints, from which leakage may occur." With reference to this leakage, Mr. Brackett writes: "Under the heading of 'Waste from Street Mains and Services,' the report gives figures which show that there is a large underground leakage from the street mains and service pipe, as distinct from the waste and leakage on the premises of the water takers. In each example given, the street mains and service pipe are considered jointly. No mention whatever is made of the leaded joints as a source of waste. The underground leakage occurs from broken mains and services, from broken connections between mains and services, also services abandoned and left running, and from defects in the leaded joints." Defects in the leaded joints are usually due to outside influences, and otherwise, it may be repeated, are not likely, if due care is exercised in putting down the pipe. It will be noted the report does not hold the leaded joints responsible for waste, but clearly shows how excessive leakage is rather very largely due to broken mains and services which often remain long undiscovered, the water escaping into sewers, into the ground, or into some stream. As an example of this we quote again from the report: "A very forcible illustration of this source of waste has been furnished in the town of Stoneham. During the first six months

A Long, Easy Curve with Full Length Pipe

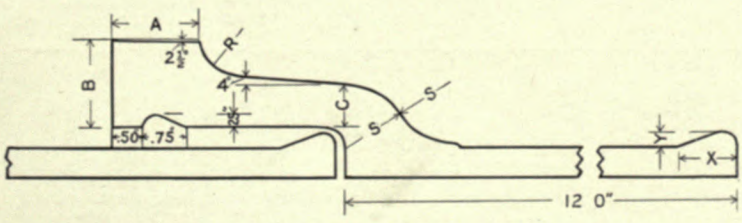
of the year 1902, about 800,000 gallons per day were supplied to the town. As this quantity appeared larger than was needed for legitimate use, an investigation was instituted for the purpose of learning where the water was used, with the result that four leaks in the street mains were found, which gave no surface indications. After these were repaired the consumption of water fell to 330,000 gallons per day, indicating that 470,000 gallons per day had been wasting from a few unseen defective pipe." In considering this report, it should be borne in mind that many of the mains which were tested form parts of water works systems installed many years ago, when perhaps not so much care was taken in the laying of pipe as is now generally the case, and in all these years, therefore, it is not surprising that because of settlement and inattention, broken mains and services developed and were overlooked. All of this goes to show that nowadays the problem is hardly that of the leaky joint, for this report is rather an argument for heavier and more permanent mains, carefully laid, and for that "eternal vigilance" in caring for them which will go a long way to insure minimum leakage. On the other hand, a moment's reflection will show that for permanent underground mains, if maximum efficiency and a minimum leakage are to be secured, short length light weight pipe, especially those with bolted joints, are to be avoided.

Cast Iron Main Before Test in Open Trench. Also Showing Curve with Straight Pipe Beyond Bend

Standard Cast Iron Pipe and Specials for Gas are made under our own Standard Specifications (so far as they apply to pipe for gas) and cast to dimensions and weights as shown in the tables, (pages 105 to 118) which have been carefully prepared with the advice and assistance of several gas engineers who are to-day identified with some of the largest gas interests in the United States, and are among the largest users of cast iron pipe for gas. In October, 1905, the tables of dimensions and weights were adopted as the standard of the American Gas Light Association. These tables may be said, therefore, to represent the most approved practice, and are here presented with confidence that they will cover every reasonable requirement. It should be noted that all gas pipe are also cast vertically in lengths to lay 12 feet, insuring a minimum number of joints and consequent reduction in leakage. This question of gas leakage receives constant attention, and we are not infrequently asked to specify the best form of joint, though



Standard Bell and Spigot for Gas



Standard Bell and Spigot for Gas with Rounded Groove in Bell

possible leaky joints are seldom responsible for more than a small percentage of gas main leakage. Selection is governed by local conditions; thus it not infrequently happens that pipe having bells calked with lead are found in the same system if not in the same line with pipe having joints made with cement.

Gas Mains with Lead Joints. In the built-up sections of cities, where streets are crowded underground with other structures, and surface traffic is heavy, the tendency seems to be to increase the thickness of the metal, and to use exclusively pipe having bells calked with lead, as securing the most flexible joint. Such pipe with lead joints are also preferable where conditions of sub-soil, as in newly made ground, indicate possible subsidence. In any location, these heavier pipe with joints well calked with lead or made with cement, afford the most permanent and safe conduit, naturally costing more than lighter pipe, but when well laid under a paved street will repay such increased cost in requiring fewer disturbances of surface and consequent extra outlays for repaving. To insure good results the lead joint must be well made; some engineers now twice calk each joint, but care should be taken to properly yarn each spigot, otherwise trouble will result. In looking for the cause of leaky lead joints in a gas main laid near one of our plants, a number of pipe were broken out of the line. On machine cutting lengthwise through the bells of joints which did *not* leak, it was found that ample yarn had been used and the lead well calked in against it. On the contrary, in cutting through several leaky joints, they were found to have been carelessly made, with the yarn put in loosely, and in some instances so little of it used it might as well have been omitted altogether. No matter whether the pipe be put down with lead or cement, the joints in the trench should be carefully made and tested, preferably before back-filling. This is perhaps more essential in gas than in water mains, and test in the open trench is now the usual practice of leading gas engineers. In gas mains, as with water, the bell and spigot joint is not the only source of leakage. Here again "eternal vigilance," in watching over the distribution mains, services and meters, aids materially to insure a minimum leakage.

Lead Joints

Gas Mains with Cement Joints. The results obtained with cement joints have been quite remarkable, and account for the growing use of pipe so laid in residence and other sections of cities and towns where the street traffic is comparatively light, as well as in the open country. One of our friends writes that from early in the year 1899, when he began using cement, to early in the year 1905, he has made joints of the following numbers:

Miles of Pipe Laid	Size	Number of Feet	Number of Leaks which developed after mains were *covered*, 1899 to 1905
9 miles 5,020 feet	4 inches	52,540	4
111 miles 2,942 feet	6 inches	589,022	2
6 miles 5,213 feet	8 inches	36,893	1
4 miles 5,158 feet	12 inches	26,278	4
2 miles 5,022 feet	16 inches	15,582	8
3 miles 2,900 feet	20 inches	18,740	10
2 miles 2,693 feet	30 inches	13,253	23
142 miles 2,548 feet		752,308	or 52 leaky joints

out of approximately 80,000 joints of pipe and specials.

UNIVERSITY OF CALIFORNIA

In the foregoing piping all joints are of cement; no lead or expansion joints were used, and the figures seem to establish the cement joint as highly satisfactory. It will be noted, however, that the number of leaky joints of 20 inches and 30 inches diameter is relatively greater. This is attributed to the fact that they were laid when the men who put them down had little experience in making cement joints of these larger sizes, and before they "appreciated the immense importance of maintaining a nearly constant temperature of joint and contiguous pipe, from the time the joint is made until it has had time to thoroughly set." Another engineer writes of an experience with cement joints extending over thirty-six years. The works now under his charge have about 122 miles of cast iron street mains, 3 inches to 36 inches. In this system, located in New England, no lead joints are used, all pipe and specials are put down with cement, and no trouble is experienced owing to expansion. While some of the mains are in paved business streets carrying comparatively heavy traffic, they are well laid in comparatively deep trenches and a leaky joint is very rare indeed, and then nearly aways due to outside influence such as excavations for other mains or structures.

Cement Joints

The limit of size of pipe with cement joints seems to vary with different engineers. One uses cement up to 16 inches; another, "up to 12 inches inclusive, and on larger sizes lead joints only, as a leaky joint is not so likely to prove dangerous to the men making repairs." Others again use cement joints up to 24 inches on comparatively long mains, while there are cement joint 30-inch and 36-inch mains of shorter lengths. In the earlier development of cement joints, bells 5 inches deep on smaller sizes, and 6 or even 7 inches deep on larger sizes, have been used, but the results have not been such as to warrant the extra expense. The good results shown in table, page 22, were obtained, with slight exceptions, with pipe having bells of the standard dimensions.

30-inch Cement Joints

Cement Joint Bells and Spigots are often made without grooves in the bell, and generally with somewhat greater joint room than for the lead joint. In making cement joints, the pipe should be supported by blocks in the usual manner and after starting a joint it should be completed promptly. In hot weather it is most important to keep the pipe cool and at a uniform temperature until the joint is set—about twenty-four hours. This may be done by covering the pipes with boards and hay, or with about 6 inches of earth kept constantly wet while the sun is on the pipe. During warm weather, as far as practicable, it is better to make the joints in the early morning, protecting them during the day, and after testing the following morning, back-fill the trench. If it is necessary

to make cement joints in freezing weather, care should be taken to warm the joints and avoid exposure to a freezing temperature until set. This involves some extra trouble and expense to provide sheet iron hoods and torches, and to more thoroughly protect the pipe in the open trench. The men handling cement should wear rubber gloves, and be trained to this work. Before entering the bells, the spigot ends of the pipe should be carefully yarned with untarred jute yarn twisted into a rope of about the same diameter as the joint space, and thoroughly grouted with neat cement mixed with water to the consistency of cream; this yarn should then be well driven against the back of the bell. The cement should be of the best quality, mixed by hand in very small quantities, in the proportion of three-fourths cement to one-fourth water by volume, and thoroughly kneaded. The cement should then be pushed into the socket with a hard wood or steel stuffing tool, then a second piece of yarn as before, twisted around the pipe and driven into the cement with calking tools, after which the joint should be faced by hand with neat cement mixed as above, finishing with a neat fillet around the end of the bell.

A Freshly Made Cement Joint

Cement Joints made in Winter. Good results in laying pipe with cement joints in winter are difficult to obtain. They can be secured, however, and the experience of one of our friends in putting down a main 8½ miles in length, partly of 16-inch and partly of 20-inch cast iron bell and spigot pipe, is of interest. This line runs in part through open country. He writes: "A large part of the work was done during the winter of 1903–1904, which was an unusually severe one, the thermometer a number of times during January and February going below zero. The thermometer averaged below freezing from the middle of December until some time in March, so that there was scarcely any weather which would have been considered suitable for making cement joints. In laying this line, the joints were tested under three pounds pressure between thirty-six and forty-eight hours after they were made. Between October 30th and December 14th, of the 1,289 joints that were made, 30 were found leaking and were remade. Between December 15th and March 8th, 2,352 joints were made, and out of these 225 were found leaking. There were 3,641 joints on the line, and the total number remade was 255. We have been over the line this year and have found it in almost perfect condition." As this was the first pipe put down with cement joints at this plant, it was necessary at the same time to train the men. Hence the loss in joints between October 30th and December 14th mainly resulted from the fact that the men were learning. The loss between December 15th and March 8th was largely due to freezing. Had the line been laid in seasonable weather, comparatively few leaks would have developed. The freezing of the joints occurred in spite of every effort to keep them covered and warm until set, but as the pipe were tested in the open trench, the leaks were easily located and remade, and the line is now most satisfactory.

High vs. Low Pressure Gas Mains. Within recent years, some engineers have

sought economy in using comparatively small diameter wrought iron or steel mains under relatively high pressure, for carrying gas from works to a center of distribution at some distance. These mains will not prove as durable as cast iron pipe, and it is a serious question whether a larger diameter cast iron main under low pressure will not in the long run prove the less costly. While the low pressure main may involve a greater first cost, the high pressure line usually carries a heavy daily charge for pumping and maintenance, added to which is often a material loss in candle power. These are factors which it is our impression have not been as carefully estimated as their importance warranted.

Gas Mains with Turned and Bored Joints. The foregoing may be said to outline general practice for lead and cement joint cast iron gas mains in the United States. Abroad, however, the practice varies, and many prominent users prefer the turned and bored joint. One prominent gas engineer in London writes: "We continue the use of gas pipe with turned and bored joints." Another, "We do not use turned and bored joints; we prefer the ordinary spigot and socket joint made with lead rings run into the socket, as being a more flexible connection, and one which can be more easily made sound by setting up, should any subsidence occur, which has tended in any way to loosen the joint." Evidently "doctors disagree." It is nevertheless true that the turned and bored joint has been adopted with satisfaction in many important gas plants in England and other countries, while we may say it is not used at all in the United States. Our inquiries as to gas leakage in cast iron pipe having turned and bored joints, have failed to bring definite response in figures or percentages, the usual statement being that the joint leakage is very small. For those who prefer an iron to iron joint, the turned and bored pipe are offered as being of the most commonly used and simplest type, avoiding use of bolts. These pipe are also cast vertically in dry sand and finished in lengths to lay 12 feet, our Standard Specifications being followed as far as they apply to pipe of this design. All bells and spigots are machined to template, insuring close fitting iron to iron joints easily laid. The turned and bored joints for gas mains should only be used in districts where streets are straight and the soil is very good and firm, as any subsidence or movement may lead to fracture and consequent large and perhaps dangerous leakage. There may be reasons for adopting the turned and bored joint of which we are not advised, but considering the excellent results obtained with the bell and spigot joint in the United States and apparently abroad, we agree with still another London engineer who writes: "I do not consider that the turned and bored joint offers any advantage over the lead joint generally used for gas mains, unless it be in the speed and facility with which they may be laid." With turned and bored pipe, special castings with bells all around are usually supplied, and into these bells a cut pipe is perhaps as often inserted as is the turned spigot.

Low Pressure Gas Main

Cast Iron vs. Riveted Steel Pipe. We are often asked regarding the life of cast iron as compared with wrought iron or steel riveted pipe. On page 16 are some notes as to the life of cast iron pipe, which may readily be confirmed, and in like manner it

will be easy to obtain reports concerning the life of riveted steel pipe that have been laid a few years, and we are confident that careful inquiry will prove beyond question that cast iron pipe is the best material.

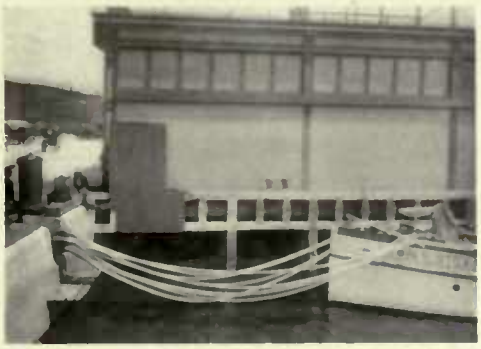
Recently, at Portland, Oregon, we were awarded the contract for cast iron pipe at a very marked increase in the total cost, as compared with tenders for steel. Owing to the distance, the cost of freighting became a most important factor, because of the great difference in weight which naturally favored the lighter or steel pipe. This award to us of the contract for cast iron pipe, was not made until after a very careful investigation on the part of the engineer, D. D. Clarke, Esq., who, during the fall of 1905, visited some fifteen cities to confer with the officials in charge of water supply, as to their experience with riveted steel mains and to ascertain for himself what he could as to their condition.

During 1893 and 1894, the city of Rochester, N. Y., put down a 38-inch steel pipe conduit made up of steel plates, ¼-inch and ⅜-inch metal. This line runs from their Overflow No. 1, about two and one-quarter miles north of Hemlock Lake to Mount Hope Reservoir, a distance of twenty-six miles. The annual report of the city of Rochester for the year 1901 shows that as early as the year 1900 leaks in the line were discovered, and found due to corrosion of the steel plates, and that in January, 1901, other leaks began to develop. Later reports show that during the year, in seven separate excavations, fifteen holes, $\frac{1}{16}$ inch to ¾ inch in diameter, were found, due to corrosion, and that more or less tuberculation was present along the joints and around the rivet heads. One sheet alone was found to contain more than five hundred pits about ⅛ inch in diameter by $\frac{1}{16}$ inch deep. A careful examination of the interior of this steel pipe indicated that the cause of the corrosion was not confined to the presence of certain active elements in the soil. Later reports indicate that during 1902 further investigation showed that a great many more leaks had developed. The reports of the city of Rochester for the years 1901 and 1902 contain interesting notes regarding the investigations made by eminent engineers. Attention is particularly directed to the report of Professor F. L. Kortright, of West Virginia University.

As a general proposition, it seems to be now conceded that on an average steel rusts at least 25 per cent. more rapidly than cast iron; and when the relative thicknesses of riveted steel and cast iron pipe are considered, it is readily seen that cast iron pipe will prove by far the more permanent. Then, again, the increased friction in riveted steel pipe reduces by 10 to 20 per cent. the flow of water, as compared with cast iron pipe of the same diameter.

Independent High Pressure Fire Systems

In the United States, during the last fifteen years high pressure fire lines have been a most important development. Among the earliest of these were the so-called "empty mains" leading from the rivers back into the business sections of Cleveland, Detroit, Milwaukee and other lake cities. At Cleveland, for instance, some 16,500 feet of 6-inch, 8-inch and 10-inch cast iron pipe have been put down since early in 1891, affording additional protection partly in the business section and partly in the lumber district. When a large fire occurs in the protected area, the harbor fire boats, one of 7,000 and the other of 4,000 gallons capacity per minute, connect with these mains and effectively assist the city fire department. While kept full in summer, as these mains were not laid below frost line they are drained in winter; but the fire boats fill them quickly and provide a pressure of about 100 to 150 pounds at the hydrants in business streets well above the river. These mains at Cleveland have proven so effective that plans are now under consideration for large extensions, including perhaps an independent pumping station. At Detroit there are about 26,000 feet of 8-inch and 10-inch pipe, chiefly in separate 8-inch lines of various lengths, in business streets running back from the river, and served by fire boats. Two of these 8-inch lines are connected through 10-inch line laid in the business center. At Milwaukee, there are about 46,000 feet of similar 8-inch and 10-inch pipe in streets running back from the rivers and canals. At Buffalo, since the fall of 1897, about 8,800 feet of independent mains have been installed. The first of these mains were of steel and the latter of cast iron, this change being necessary on account of the deterioration of the steel pipe.



Fire Boat Connection

Six Lines from High Pressure Hydrant. See Next Photo-plate

They are kept full in summer, and empty during extreme cold weather. One or two fire boats are used, as necessity requires, and at the farthest hydrant a pressure of 275 pounds has been obtained and maintained, and on one test the two boats gave a pressure of 350 pounds at a distance of 2,500 feet with one line from the hydrant. In practice, the pressure of course varies with the number of lines in use at a fire, and we understand that it rarely exceeds 200 pounds at the hydrant. One objection to these independent fire boat mains is that the fire boats may be prevented, by shipping, the blocking of slips by vessels, and in winter because of ice, from promptly reaching the bulkhead line for connection to mains. It is claimed that the fact that the pipes are empty in winter does not delay the supply, as the time occupied by fire boats in filling the mains about equals the time used by the fire company in proceeding from quarters and connecting hose to hydrant. On the other hand, some engineers claim that these fire mains should be laid below frost line and kept full, always ready, and where practicable, connected up to sprinkler systems and to a standpipe in all large buildings, the high pressure to be turned in from street when necessary. These connections should prove a source of

revenue, or at least cover their cost and maintenance. Probably the first complete system of independent fire mains is that at Providence, R. I., which was put down in 1897, and consists of some 29,400 feet of 12-inch, 16-inch and 24-inch cast iron pipe, supplied by gravity, which affords about 100 pounds pressure at the hydrants. The system is so designed, however, as to admit of adding pumps to bring the pressure up to about 150 pounds at the hydrant.

Later developments in the separate fire main systems are those at Philadelphia and Brooklyn, the latter as yet hardly complete. They are independent high pressure plants, ready for instant use. The mains laid below frost line are kept full under moderate pressure the year around, provision being made for circulation and draining, and they are connected with independent stations in which are installed high pressure power pumps, which on signal bring the pressure almost immediately up to 200 pounds or more at the hydrant.

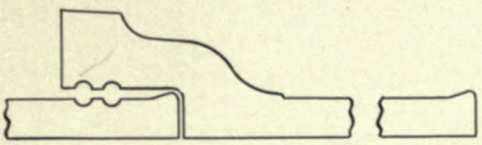
Six High Pressure Streams from One Hydrant

In Philadelphia the present system, which comprises some 34,000 feet of pipe, is an added protection to the congested area, which is about 6,500 feet long, running back from the Delaware River to Broad Street, by about 2,500 feet wide, between Walnut and Race Streets. The water supply is taken from the river. The pump house is on the water front, and is connected with numerous telephone stations throughout the district, and with the regular fire alarm system. There are also several fire boat connections for emergencies. The pump house contains seven units, with a combined capacity of about 10,400 gallons per minute. These are triplex, double-acting, geared plunger pumps, driven by gas engines. They supply a 20-inch discharge main, which, a short distance from the station, branches into 16-inch mains. There are three 12-inch mains and one 16-inch main leading from the river front to Broad Street, with cross connections of 8-inch mains at intervals of about every three blocks. These diameters are nominal, being reduced more or less by the thickness of metal in the pipe used. The mains, normally under about 75 pounds pressure, are kept filled through check valve connections with certain of the city water mains. In case of fire, within a minute the pressure at any hydrant may be brought up to 200 pounds or more if necessary. The pipe are all of cast iron, but in this Philadelphia system, flange pipe were used, and after completion, lead expansion joints were inserted to overcome the difficulty experienced with the flanged joints owing to expansion and contraction. For the earlier installations, including the fire line at Boston, the new systems at Brooklyn, and for the Manhattan district, New York, cast iron bell and spigot pipe were adopted. At Philadelphia, the

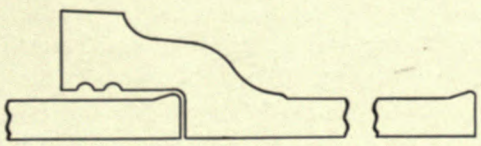
hydrants are of the gate type, the pressure tending to force the valve off the seat, while those at Brooklyn are of the compression type, the tendency of the water pressure being to close the valve. While the New York and Brooklyn systems are naturally expected to be a marked improvement upon the earlier Philadelphia system, the latter has so far given excellent service, and in the congested section covered, the Board of Fire Underwriters have reduced the insurance rates 25 cents per $100, which represents a large annual saving in the cost of insurance in the protected district. In Brooklyn, it is estimated a similar reduction in the cost of insurance would result in a "saving of about $550,000 a year, which represents about 7.7 times the total estimated cost of maintenance and operation, plus interest and sinking fund charges for the high pressure fire system." The credit in Philadelphia, however, was in part due to the removal of a penalty for deficient water supply.

High Pressure Fire Stream

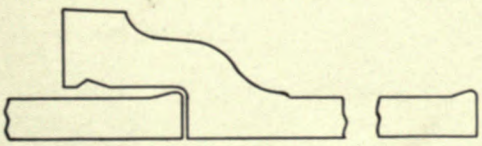
In the general scheme of a proposed new installation of high pressure fire mains in New York, two independent pumping stations on the water front are proposed, each to have a present capacity of 15,000 gallons per minute, the pumps to be of the centrifugal type, multi-stage, direct connected to electric motors, which in starting will insure service at full pressure in about one minute. The pumps are designed to readily give 300 pounds pressure at the pump house, which, allowing for frictional loss in the mains, will give a pressure at the base of all hydrants of about 250 pounds per square inch. In each station the intake and discharge lines to the distribution mains will be duplicated, and at each station the pumping plant will be divided into so many units that it will be practically impossible for any station to completely break down or entirely cripple the high pressure system. The distribution mains will be of the cast iron bell and spigot type, having deep double lead grooves in both bell and spigot ends of the pipe. The special castings will be of cast iron, with the exception of the larger tees and crosses, which, weakened by the area cut out for the branches, will be made of steel. The pipe will be of 1⅞-inch metal for 24-inch size, 1½-inch metal for 20-inch size, 1¼-inch metal for 16-inch size, 1-inch metal for 12-inch size, and ⅞-inch metal for 8-inch size, (the latter for hydrant connections only) and tested at the foundry



Double Groove Bell and Spigot High Pressure Pipe, Furnished to Order with Pipe per Table No. 4, Page 46



Double Groove Bell and Regular Spigot High Pressure Pipe



Standard High Pressure Bell and Spigot. (See Table No. 4, Page 46.)

to a pressure of 650 pounds per square inch. These pipe are similar to those used in the Brooklyn system, in which 20-inch is now the largest diameter, and it will be noted that these cast iron pipe to work under 250 pounds pressure at the hydrant, are of the bell and spigot type, calked with lead in the ordinary way. Such joints have been tested to 750 pounds pressure, while 250 pounds is usually considered ample for these high pressure fire mains. The use of such mains is steadily finding favor, and must increase as their value and the lessened cost of insurance becomes apparent. Chicago, Baltimore, Toronto and other cities have under consideration important independent fire main installations. Not only for large cities and towns are these mains practicable, but also in comparatively small towns, and for important isolated manufacturing plants will they find favor. Many of the latter have their own electric power, which in case of fire could readily be diverted to electric motors direct connected to the centrifugal or other power pumps of an independent fire system, which in some instances can be combined with village or town protection. The effect on insurance rates will often justify the protected property owners in assuming alone the cost of installation and maintenance.

Hydraulic Power Mains. For pressures up to 750 pounds, the smaller sizes of cast iron bell and spigot pipe may be used around manufacturing plants for underground mains, the form of socket being altered somewhat for pressures above 250 pounds. Such piping is made to order only. While hydraulic power is largely used by steel works and other manufacturing plants in this country, we have no installation for public supply corresponding to the well known plant of the London Hydraulic Power Company, which has now been in successful operation for more than twenty years, and supplies motive power from over 150 miles of mains, to which in 1905 were connected 5,597 machines. The power is available day and night the year around, operating direct-acting hydraulic lifts and motors, and is also used for injector fire hydrants, affording special fire protection, and for ejectors, the latter being extensively used for raising water. The first of these independent hydraulic power works was put down in 1877 at Hull. The plant in London was commenced seven years later, and such works have now been installed in Liverpool, Manchester, Glasgow and other cities in England, and at Melbourne and Sydney in Australia. In London, the Company pumps its water from the Thames, while in Manchester, for instance, the supply is taken from the city mains, which saves much in pumping. In London, the working pressure is 700 pounds, while in Manchester it is 1,120 pounds. All of the mains are of cast iron. Hydraulic power has uses and advantages which even electricity cannot supplant, and it would seem that in congested districts similar power plants could be worked to advantage and economy for office building elevators and lifts, and presses in warehouses, releasing valuable space now occupied by pumps and extra boilers, to say nothing of its use for numerous other power purposes.

Handling Pipe with Moore's Patent Traveler

In London, the average charge for hydraulic power is much the same as the average charge for electric energy within the same area, and as compared with electric lifts, the hydraulic elevator

is certainly as good if not better, whether considered from the view point of safety, economy or convenience.

Sewers. There is a notable and very marked increase in the use of cast iron pipe for sewers, not only for sewage force mains, but especially in locations liable to subsidence, such as in marshy ground, newly filled streets, or where the sub-soil conditions make desirable a more permanent construction than is secured by the ordinary brick sewer. Cast iron pipe are also used to advantage on hills, where the rush of water during storms is liable to wash out the ordinary brick or tile sewer which may have been disturbed by the action of frost. During the past year we have furnished for sewers, several lines of 30-inch to 60-inch cast iron pipe, and their increasing use for sewers has become an important factor. Except for force mains, usually pipe of our Class A dimensions and weights are specified, but there are often locations which necessitate the use of heavier pipe. The thickness of pipe to be used is a question for the engineer, and while the use of cast iron pipe naturally involves a larger initial cost, this difference is inconsiderable when compared with advantages secured through the more substantial and lasting construction.

Culverts and Drains. The very extensive use nowadays of cast iron pipe for railroad culverts and drains is well understood, as is also their adoption by township commissioners for drains under country roads. They are indeed an important factor in "good roads" development. The largely increased demand is the natural result which has followed the appreciation of the many advantages derived from the use of cast iron pipe for culverts. One length of cast iron pipe will lay 12 feet, and may be used instead of six 2-foot lengths of vitrified pipe, thus minimizing the risk of washout by markedly reducing the number of joints. As compared with a brick or stone culvert, the cast iron pipe culvert is less liable to be affected by the action of frost, while the smooth interior of the pipe is not easily obstructed and may readily be cleaned. Aside from this, cast iron pipe culverts are of relatively great strength and easily and cheaply put down, it being simply necessary to see that the pipe have an even bearing, that the joints are supported and that the material about the pipe is carefully tamped under and around them, at least up to their center line. They are often laid even without the setting in masonry of the upstream end. A brick or masonry facing, however, is desirable for permanent culverts, as tending to prevent undermining the pipe. Where roads cross streams which in times of freshet may be greatly enlarged, it is not unusual to provide several parallel lines of pipe to take care of the increased flow. We now make cast iron pipe up to 84 inches inside diameter, as shown in Table No. 2. Where there is not space for the larger diameters, two or more parallel lines of smaller pipe may often be used to advantage. The following table shows the weight per cubic foot of embankment material. To determine the pressure per square foot of embankment upon the horizontal surface of pipe, multiply the weight per cubic foot by the height of the fill above the pipe. Thus it will be seen, for high embankments only heavy pipe should be used, and great care taken to so lay the pipe that they will not be subject to undue subsidence.

Embankment Materials—Weights per Cubic Foot

Material	Average Weight	Specific Gravity	Average Voids
Granite	166 pounds	2.666	.....
Coarse Gravel	120 pounds	1.925	.28 per cent.
Gravel	116 pounds	1.861	.30 per cent.
Sharp Sand	110 pounds	1.765	.33 per cent.
Clay	125 pounds	1.440	.12 per cent.
Water	62.5 pounds	1.000	.....

Submerged Pipe

Laying 24-inch Flexible Joint Pipe Across Chelsea Creek, Boston

For river crossings or intake lines, cast iron pipe are used with flexible joints. Underwater conditions usually determine the type of joint and thickness of metal in the pipe selected. Submerged mains are generally so inaccessible and so seldom duplicated in a given location, that the risk of failure for any cause should be minimized by a due regard for outside influences. Care should be taken to so locate river crossings as to avoid injury to the pipe from passing boats, and in shallow waters, from ice, drift and snags. Where damage to the main may result from these causes, that portion of the line liable to disturbance should if possible be laid in a trench dredged out for it. When necessary in laying to work from a barge or raft, current and tidal conditions should be noted, and provision made to hold the float directly in the line of crossing.

The photograph clearly indicates how a line of 24-inch flexible joint pipe, Type No. 2, was laid across Chelsea Creek, Boston, a distance of some 1,438 feet. As the pipe were jointed the barge was moved forward sufficiently to admit of placing the next length as shown.

At New Orleans, our Type No. 4 flexible joints with intermediate lengths of flange pipe were used to make up two 36-inch discharge lines for the river end of a 48-inch cast iron sewage force main. The photograph shows one of these 36-inch outlets just before lowering, the curved end piece to be turned down-stream. The river end section of the 48-inch main, carried on a trestle of creosoted timber, runs out under an old wharf at the head of Spain Street, slightly above the mean gulf level. Near the end of the wharf, flanged

Out-flow Pipe, with Type 4 Flexible Joints, as Used at New Orleans

connections divide the piping into the two 36-inch outlet lines which first have a vertical drop of some 18 or 20 feet and then curve out into the river. To clear the way for these pipe lines, old wharf piles were cut off by jetting alongside and using dynamite placed by a diver, and trenches for the pipe were cut out by a suction dredge.

Two 36-inch Pipe Lines Across Mystic River, Boston

In other flexible joint mains for river crossings and other deep waters, such a curve as is indicated in the photograph is sometimes necessary, where banks are steep and the bottom dips off abruptly, or, instead, one or two short lengths of flexible pipe may be used.

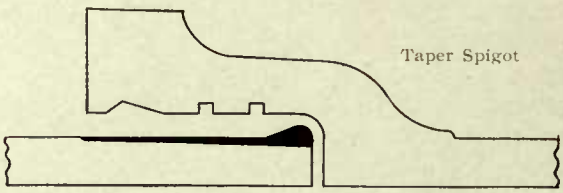
When it is necessary to carry an important supply across a river, to minimize the risk of failure in case of accident it is safer to put down two separate mains. The photograph shows the end of a 48-inch low service pipe line divided into two 36-inch lines across Mystic River, Boston. Valves are placed at each end of the 36-inch pipe so that when necessary the flow may be maintained through one line while repairs are made to the other. As the river bottom was covered with mud for a depth of 10 feet or more, the pipe were laid on pile supports in bents 12 feet apart. For a distance of 100 feet under the channel, the pipe are about 10 feet below mean low water, rising gradually on either side. Here the shallow crossing permitted the use of a mixed line of three types of joints. They were first, pipe of the regular bell and spigot standard except that the bells were made with three grooves instead of one; second, were the same, with the spigots turned to a uniform slight taper so as to be interchangeable; and third, flexible joint pipe Type No. 2, which were used where there were vertical deflections or future subsidence was probable. The pipe were put together on shore, in sections generally of six pipe, much as described under taper joint pipe, page 34, then loaded on the pipe-laying scow and moved out over the location. This scow was provided with two derricks, from which hung a stiff truss about 75 feet in length, to which the pipe were attached and then swung clear and to one side of the scow, and when the latter had been adjusted to the proper position the pipe were lowered and the taper spigot of one end of the section inserted in the leaded bell of the preceding section. The two sections were then drawn together by hydraulic power, and the taper joint between them calked by a diver.

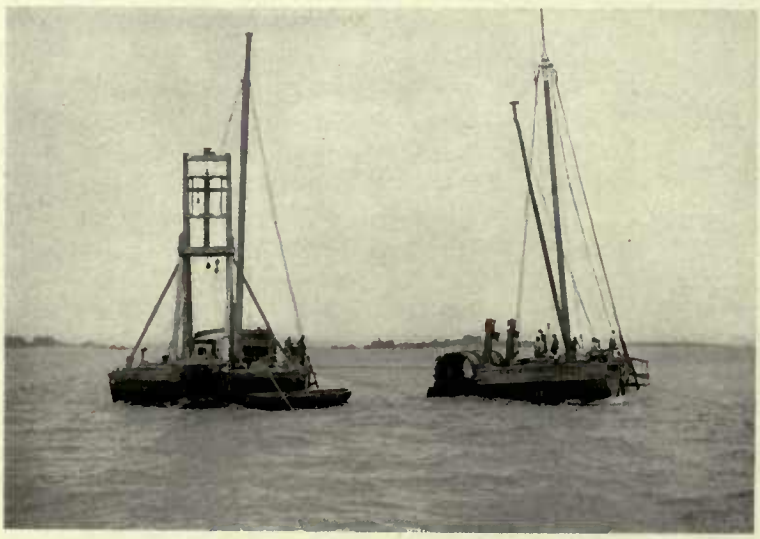
Laying 36-inch Pipe Across Mystic River, Boston

Taper Joint Pipe for submerged lines under moderate pressures, on comparatively level bottoms with easy off shore slopes, are usually ordered in sets of so many lengths having standard spigots and special bells, and a like number having standard bells and machined taper spigots, as shown in the cut, and usually, with twice as many lengths of

60-inch Pipe on Phillips' Patent Caisson, Ready for Lowering

standard bell and spigot pipe, the latter often with two or three lead grooves, depending on the proposed location of the line. In laying, a taper joint thus comes between every two or three sets of the standard bell and spigot joints. If the line is put down in 48-foot sections, two of the special pipe and two standard pipe are required for each section. At the shore end, upon the wharf or barge, the taper spigot is temporarily inserted in the bell of a special pipe which will form the front or outward end of a section, and the lead space run full with lead but not calked. The taper spigot is then withdrawn to be used as the rear end of the following section. The leaded bell is then fitted with a temporary collar, provided with guides to insure entry of spigot without injury to mold. The four lengths are then put together on the barge or float, the joints made in the ordinary way, and the float towed to the proper location for lowering, and once in line on the the bottom, the section is moved so that taper spigot is drawn home into the leaded bell of the preceding section. This is usually done by ratchet jacks or hydraulic power controlled by divers, who then calk the taper joint. Various methods for handling and lowering have been adopted (see page 35), but as shown in the accompanying cut, the Phillips' patent caisson affords many advantages. The cut indicates the manner in which the two 60-inch cast iron submerged outfall sewage lines of the Metropolitan Water and Sewerage Board were laid. They extend to a point something over a mile beyond low water, the bottom of the pipe being placed at an average depth of 9 feet below the bed of the harbor, and each pipe rests on two pile supports. To accomplish this, the trench was dredged out to



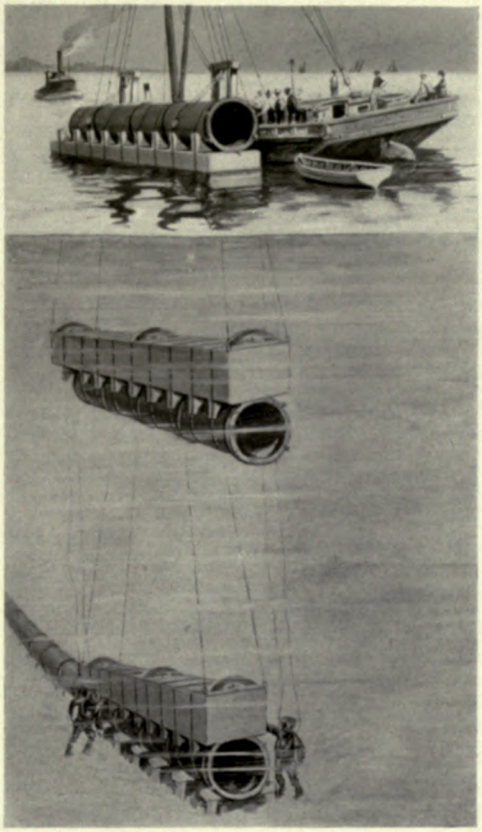


Bringing 60-inch Pipe into Position for Lowering

30-inch Intake Line, Floated into Position Before Lowering

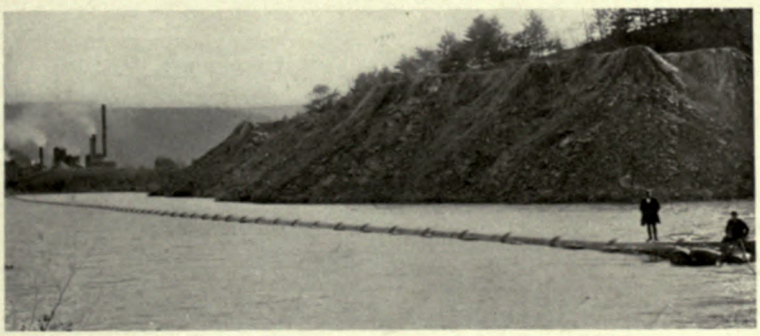
a width of 10 feet at the bottom and 30 feet at the top, and after they were laid, the pipe were covered in by material from scows. When floated out over the line, the section of jointed pipe was secured to the caisson, and which, as used, was 6 feet square by 52 feet long, divided into nine compartments which could be separately flooded. When empty this caisson would support 24 tons, and when filled it would sink. Hence, when carrying the pipe to sink, it was only necessary to partially flood the compartments.

When the caisson was released from the lighter, it would turn over, and when sufficiently flooded would soon reach the bottom, where, still attached to it, the pipe were adjusted to line and grade, the special joint drawn home and calked, after which the caisson was cut loose, hauled up and pumped out.



Placing 60-inch Outfall Pipe, Using Phillips' Patent Caisson. Metropolitan Water and Sewerage Board

Intake Lines, usually laid out into a lake or smaller stream, are not likely to be disturbed, except possibly by ice, and where the bottom is smooth, with a gradual slope, the main may thus be made up partly of flexible and partly of bell and spigot taper joint pipe, and in some locations the latter pipe of larger sizes, with bell and taper spigots alone, or interspersed with regular bell and spigot pipe, may be used. The accompanying views show a 30-inch intake main about 1,700 feet in length, laid about three years ago, which, as it was put together on the bank, was floated upstream into the desired position and then lowered on to the bottom 6 to 8 feet below the surface. Here the underwater condition and service admitted of using bell and spigot pipe.



30-inch Intake Line Floated Out into Stream Before Lowering

Standard Specifications

The standard specifications for cast iron pipe and special castings, will be found to be substantially those of the New England Water Works Association, modified to cover the four classes of pipe shown in our Table No. 2, instead of the ten classes listed in Table No. 2 of the New England Specifications, while many of the dimensions in our Table No. 1 are identical with those of the New England Table No. 1. Officers of this Company were members of the Foundries Committee which conferred with the Committee of the New England Water Works Association when that committee had in preparation the New England Specifications, and the tables of standard dimensions and weights here presented may be said to be the New England tables brought down to a merchantable basis. It will be noted that in Section 1, third paragraph, provision is made for intermediate weights, so that other weights than those we specify in Table No. 2 may be obtained, if essential. We have also added, as shown in Tables No. 3 and No. 4, four heavier classes for fire line and other high pressure service.

As to the specials, except in the larger tees and crosses, these will also be found to closely follow the New England tables, the line having been made somewhat more complete. On laying down the New England line of tees and crosses, we found it necessary to slightly lengthen the run on all tees and crosses 30 inches diameter on the run and larger, where the arm is 14 inches or larger, in order to secure additional metal in the corner section and avoid having the outside contour of the run bell cut into by the arm. The tees and crosses have also been thickened in corner sections and on the flats, and the design varied as increase in pressure required. The metal strains in the flats are so complex that they cannot be figured accurately, and it is essential, therefore, to avoid making the run too short, thereby reducing the metal in corner sections below a safe limit. The weights for all special castings are estimated, and some, therefore, may exceed somewhat the usual variation percentages.

Standard Specifications for Cast Iron Pipe and Special Castings*

Description of Pipe

SECTION 1. The pipe shall be made with hub and spigot joints, and shall accurately conform to the dimensions given in Tables No. 1 and No. 2. They shall be straight and shall be true circles in section, with their inner and outer surfaces concentric, and shall be of the specified dimensions in outside diameter. They shall be at least 12 feet in length, exclusive of socket. For pipe of each size from 4-inch to 24-inch inclusive, there shall be two standards of outside diameter, and for pipe from 30-inch to 60-inch inclusive, there shall be four standards of outside diameter, as shown by Table No. 1. The outside diameters to be cast on pipe above 4-inch.

All pipe having the same outside diameter shall have the same inside diameter at both ends. The inside diameter of the lighter pipes of each standard outside diameter, shall be gradually increased for a distance of about 6 inches from each end of the pipe so as to obtain the required standard thickness and weight for each size and class of pipe.

Pipe of standard thickness and weight, intermediate between the classes in Table No. 2, shall be made of the same outside diameter as the next heavier class. Pipe with

*For dimensions and weights see table pages.

standard thickness and weight less than shown by Table No. 2, shall be made of the same outside diameter as the Class A pipe, and pipe with thickness and weight more than shown by Table No. 2, shall be made of the same outside diameter as the Class D pipe.

For pipe 4-inch to 12-inch inclusive, one class of special castings shall be furnished, made from Class D pattern. Those having spigot ends shall have outside diameters of spigot ends midway between the two standards of outside diameter, as shown by Table No. 1, and shall be tapered back for a distance of 6 inches. For pipe from 14-inch to 24-inch inclusive, two classes of special castings shall be furnished: Class B special castings with Classes A and B pipe, and Class D special castings with Classes C and D pipe; the former shall have cast on them the letters "A B" and the latter "C D." For pipe 30-inch to 60-inch inclusive, four classes of special castings shall be furnished, one for each class of pipe, and shall have cast on them the letter of the class to which they belong.

Allowable Variation in Diameter of Pipe and Sockets

SECTION 2. Especial care shall be taken to have the sockets of the required size. The sockets and spigots will be tested by circular gauges, and no pipe will be received which is defective in joint room from any cause. The diameters of the sockets and the outside diameters of the bead ends of the pipe, shall not vary from the standard dimensions by more than .06 of an inch for pipe 16 inches or less in diameter, .08 of an inch for 18-inch, 20-inch and 24-inch pipe, .10 of an inch for 30-inch, 36-inch and 42-inch pipe, .12 of an inch for 48-inch, and .15 of an inch for 54-inch and 60-inch pipe.

Allowable Variation in Thickness

SECTION 3. For pipe whose standard thickness is less than 1-inch, the thickness of metal in the body of the pipe shall not be more than .08 of an inch less than the standard thickness, and for pipe whose standard thickness is 1 inch or more, the variation shall not exceed .10 of an inch, except that for spaces not exceeding 8 inches in length in any direction, variations from the standard thickness of .02 of an inch in excess of the allowance above given shall be permitted.

For special castings of standard patterns a variation of 50 per cent. greater than allowed for straight pipe shall be permitted.

Defective Spigots may be Cut

SECTION 4. Defective spigot ends on pipe 12 inches or more in diameter may be cut off in a lathe and a half-round wrought-iron band shrunk into a groove cut in the end of the pipe. Not more than 12 per cent. of the total number of accepted pipe of each size shall be cut and banded, and no pipe shall be banded which is less than 11 feet in length, exclusive of the socket.

In case the length of a pipe differs from 12 feet, the standard weight of the pipe given in Table No. 2 shall be modified in accordance therewith.

Special Castings

SECTION 5. All special castings shall be made in accordance with the cuts and the dimensions given in the tables forming a part of these specifications.

The diameters of the sockets and the external diameters of the bead ends of the

special castings, shall not vary from the standard dimensions by more than .12 of an inch for castings 16 inches or less in diameter, .15 of an inch for 18-inch, 20-inch and 24-inch, .20 of an inch for 30-inch, 36-inch and 42-inch, and .24 of an inch for 48-inch, 54-inch and 60-inch. These variations apply only to special castings made from standard patterns.

The flanges on all manhole castings and manhole covers, shall be faced true and smooth and drilled to receive bolts of the sizes given in the tables. The manufacturer shall furnish and deliver all bolts for bolting on the manhole covers, the bolts to be of the sizes shown on plans, and made of the best quality of mild steel, with hexagonal heads and nuts and sound, well-fitting threads.

Marking

SECTION 6. Every pipe and special casting, shall have distinctly cast upon it the initials of the maker's name. When cast especially to order, each pipe larger than 4-inch may also have cast upon it figures showing the year in which it was cast and a number signifying the order, in point of time, in which it was cast, the figures denoting the year being above and the number below, thus:

1901	1901	1901
1	2	3

also any initials, not exceeding four, which may be required by the purchaser. The letters and figures shall be cast on the outside and shall not be less than 2 inches in length and ⅛ of an inch in relief, for pipe 8 inches in diameter and larger. For smaller sizes of pipe, the letters may be 1 inch in length. The weight and the class letter shall be conspicuously painted in white on the inside of each pipe and special casting after the coating has become hard.

Allowable Percentage of Variation in Weight

SECTION 7. No pipe shall be accepted the weight of which shall be less than the standard weight by more than 5 per cent. for pipe 16 inches or less in diameter, and 4 per cent. for pipe more than 16 inches in diameter, and no excess above the standard weight of more than the given percentage for the several sizes shall be paid for. The total weight to be paid for, shall not exceed for each size and class of pipe received the sum of the standard weights of the same number of pieces of the given size and class, by more than 2 per cent.

No special casting shall be accepted, the weight of which shall be less than the standard weight, by more than 10 per cent. for pipe 12 inches or less in diameter, and 8 per cent. for larger sizes, except that curves, Y pieces and breeches pipe may be 12 per cent. below the standard weight, and no excess above the standard weight of more than the above percentages for the several sizes, will be paid for. These variations apply only to castings made from the standard patterns.

Quality of Iron

SECTION 8. All pipe and special castings shall be made of cast iron of good quality and of such character as shall make the metal of the castings strong, tough and of even grain, and soft enough to satisfactorily admit of drilling and cutting. The metal shall

be made without any admixture of cinder iron or other inferior metal, and shall be remelted in a cupola or air furnace.

Tests of Material

*Section 9. Specimen bars of the metal used, each being 26 inches long by 2 inches wide and 1 inch thick, shall be made without charge as often as the engineer may direct, and in default of definite instructions, the contractor shall make and test at least one bar from each heat or run of metal. The bars, when placed flatwise upon supports 24 inches apart, and loaded in the center, shall support a load of 1,800 pounds and show a deflection of not less than .30 of an inch before breaking; or, if preferred, tensile bars shall be made, which will show a breaking point of not less than 18,000 pounds per square inch. The contractor shall have the right to make and break three bars from each heat or run of metal, and the test shall be based upon the average results of the three bars. Should the dimensions of the bars differ from those above given, a proper allowance therefor shall be made in the results of the tests.

Casting of Pipe

Section 10. The straight pipe shall be cast in dry sand molds, in a vertical position. Pipe 16 inches or less in diameter shall be cast with the socket end up or down, as specified in the proposals. Pipe 18 inches or more in diameter shall be cast with the socket end down.

The pipe shall not be stripped or taken from the pit while showing color of heat, but shall be left in the flasks for a sufficient length of time to prevent unequal contraction due to subsequent exposure.

Quality of Castings

Section 11. The pipe and special castings shall be smooth, free from scales, lumps, blisters, sand holes and defects of every nature which unfit them for the use for which they are intended. No plugging or filling will be allowed.

Cleaning and Inspection

Section 12. All pipe and special castings shall be thoroughly cleaned and subjected to a careful hammer inspection. No casting shall be coated unless entirely clean and free from rust, and approved in these respects by the engineer, immediately before being dipped.

Coating

Section 13. Every pipe and special casting shall be coated inside and out with coal-tar pitch varnish. The varnish shall be made from coal tar. To this material sufficient oil shall be added to make a smooth coating, tough and tenacious when cold, and not brittle nor with any tendency to scale off.

Each casting shall be heated to a temperature of 300 degrees Fahrenheit immediately before it is dipped, and shall possess not less than this temperature at the time it is put in the vat. The ovens in which the pipe are heated shall be so arranged that all

* This Company will make pipe under higher metal tests when desired.

portions of the pipe shall be heated to an even temperature. Each casting shall remain in the bath at least five minutes.

The varnish shall be heated to a temperature of 300 degrees Fahrenheit (or less if the engineer shall so order), and shall be maintained at this temperature during the time the casting is immersed.

Fresh pitch and oil shall be added when necessary to keep the mixture at the proper consistency, and the vat shall be emptied of its contents and refilled with fresh pitch when deemed necessary by the engineer. After being coated the pipe shall be carefully drained of the surplus varnish. Any pipe or special casting that is to be recoated shall first be thoroughly scraped and cleaned.

Hydrostatic Test

SECTION 14. When the coating has become hard, the straight pipe shall be subjected to a proof by hydrostatic pressure and, if required by the engineer, they shall also be subjected to a hammer test under this pressure.

The pressure to which the different sizes and classes of pipe shall be subjected is as follows:

	20-Inch Diameter and Larger Pounds per Square Inch	Less than 20-Inch Diameter Pounds per Square Inch
Class A Pipe	150	300
Class B Pipe	200	300
Class C Pipe	250	300
Class D Pipe	300	300

Weighing

SECTION 15. The pipe and special castings shall be weighed for payment, under the supervision of the engineer, after the application of the coal-tar pitch varnish. If desired by the engineer, the pipe and special castings shall be weighed after their delivery, and the weights so ascertained shall be used in the final settlement, provided such weighing is done by a legalized weighmaster. Bids shall be submitted and a final settlement made upon the basis of a ton of 2,000 pounds.

Contractor to Furnish Men and Materials

SECTION 16. The contractor shall provide all tools, testing machines, materials and men necessary for the required testing, inspection and weighing at the foundry of the pipe and special castings; and, should the purchaser have no inspector at the works, the contractor shall, if required by the engineer, furnish a sworn statement that all of the tests have been made as specified, this statement to contain the results of the tests upon the test bars.

Power of Engineer to Inspect

SECTION 17. The engineer shall be at liberty at all times, to inspect the material at the foundry, and the molding, casting and coating of the pipe and special castings. The forms, sizes, uniformity and condition of all pipe and other castings herein referred to,

shall be subject to his inspection and approval, and he may reject, without proving, any pipe or other casting which is not in conformity with the specifications or drawings.

Inspector to Report

SECTION 18. The inspector at the foundry, shall report daily to the foundry office, all pipe and special castings rejected, with the causes for rejection.

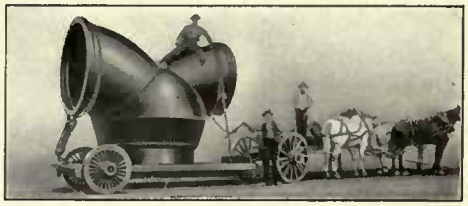
Castings to be Delivered Sound and Perfect

SECTION 19. All the pipe and other castings must be delivered in all respects sound and conformable to these specifications. The inspection shall not relieve the contractor of any of his obligations in this respect, and any defective pipe or other castings which may have passed the engineer at the works or elsewhere, shall at all times be subject to rejection when discovered, until the final completion and adjustment of the contract; provided, however, that the contractor shall not be held liable for pipe or special castings found to be cracked after they have been accepted at the agreed point of delivery. Care shall be taken in handling the pipe, not to injure the coating, and no pipe or other material of any kind shall be placed in the pipe during transportation or at any time after they receive the coating.

Definition of the Word "Engineer"

SECTION 20. Wherever the word "engineer" is used herein it shall be understood to refer to the engineer or inspector acting for the purchaser, and to his properly authorized agents, limited by the particular duties intrusted to them.

Standard Cast Iron Pipe and Special Castings



For water pipe, see pages 43 and 44, Tables 1 and 2.
For high pressure pipe, see pages 45 and 46, Tables 3 and 4.
For flexible joint pipe, see pages 47 and 48, Tables 5 and 6.
For flange pipe for water, see pages 82 to 85, Tables 43 to 46.
For gas pipe, see pages 105 and 106, Tables 79 and 80.
For flange pipe for gas, see page 116, Table No. 104.
All dimensions given are in inches.

The following tables represent in a general way the standardization of the product of this Company, in conformity with the Standard Specifications on pages 36 to 41. The development of these lines has involved study extending over a long period, during which the requirements of engineers and other pipe users have had careful consideration, while the best foundry practice and elements affecting cost have not been lost sight of. Necessarily it will be some little time before our several works are fully equipped with patterns, fixtures, etc., to provide promptly all the standards listed, and unless, therefore, these standards are specified on orders, the right is reserved to ship pipe and specials of corresponding sizes and metal thicknesses made from our nearest stock patterns.

We are now prepared to offer standard cast iron bell and spigot pipe made of the general dimensions and weights given in Tables No. 1 and No. 2, for water, sewage, culverts, drains, pneumatic service, etc., and much of our regular stock is now made accordingly. The metal thicknesses given in Table No. 2 have been carefully figured, with such added allowances in the smaller pipe as experience has proven essential to good foundry practice, and which are now required by most engineers. The larger sizes of Class A carry slight allowances for transportation and handling. When essential, lighter pipe or pipe of weights intermediate to any two of the several classes, will be furnished as provided in the third paragraph of Section 1 of the specifications.

Certain odd sizes, 5-inch, 7-inch, 9-inch, 15-inch, 22-inch and 40-inch, with specials, will be made to order when required, but are not carried in stock. Regular sizes, 4-inch to 84-inch, should be selected as far as practicable, in laying out work, thus delays and possible extra cost will be avoided.

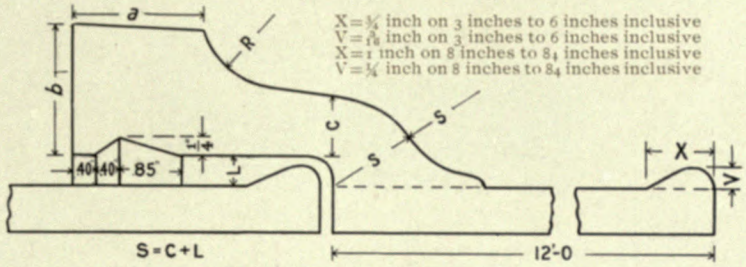
Turned and Bored Pipe. While we are prepared to furnish pipe of this type, they are so little called for in the United States that they are necessarily special with us, and therefore are made only on order. This usually involves some delay in delivery, owing to machining, as compared with deliveries of regular sizes of bell and spigot pipe for lead joints. Our turned and bored pipe are made to the general dimensions given in Table No. 1, so far as they apply, and owing to extra metal in socket and spigot will run slightly heavier for corresponding sizes and classes.

Inquiries and **orders** should clearly indicate the approximate number of lengths or feet of pipe of each size and class required. Give the desired delivery point and time of shipment, with any particulars as to sizes required first, the service intended, etc.; this will facilitate prompt attention and avoid delays.

Standard short length bell and spigot pipe in lengths to lay 12 inches, varying by 6-inch steps up to lengths to lay 72 inches, are classed as special castings. In ordering these short length bell and spigot pieces, Table No. 45 may be used, with the following code stems as prefixes to terminals.

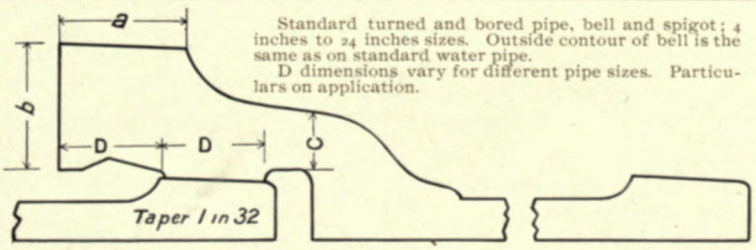
Class A—Stem	**Acpe**	Class C—Stem	**Acri**
Class B—Stem	**Acra**	Class D—Stem	**Actu**

TABLE No. 1—General Dimensions of Pipe—Classes A, B, C, D



X=1/4 inch on 3 inches to 6 inches inclusive
V=1/8 inch on 3 inches to 6 inches inclusive
X=1 inch on 8 inches to 84 inches inclusive
V=1/4 inch on 8 inches to 84 inches inclusive

Nominal Diam. Inches	Classes	Actual Outside Diameter Inches	Diam. of Sockets		Depth of Sockets		A	B	C
			Pipe Inches	Special Castings Inches	Pipe Inches	Special Castings Inches			
3	A	3.80	4.60	4.66	3.50	3.50	1.25	1.30	.65
3	B—C—D	3.96	4.76	4.66	3.50	3.50	1.25	1.30	.65
4	A	4.80	5.60	5.70	3.50	4.00	1.5	1.30	.65
4	B—C—D	5.00	5.80	5.70	3.50	4.00	1.5	1.30	.65
6	A	6.90	7.70	7.80	3.50	4.00	1.5	1.40	.70
6	B—C—D	7.10	7.90	7.80	3.50	4.00	1.5	1.40	.70
8	A—B	9.05	9.85	10.00	4.00	4.00	1.5	1.50	.75
8	C—D	9.30	10.10	10.00	4.00	4.00	1.5	1.50	.75
10	A—B	11.10	11.90	12.10	4.00	4.00	1.5	1.50	.75
10	C—D	11.40	12.20	12.10	4.00	4.00	1.5	1.60	.80
12	A—B	13.20	14.00	14.20	4.00	4.00	1.5	1.60	.80
12	C—D	13.50	14.30	14.20	4.00	4.00	1.5	1.70	.85
14	A—B	15.30	16.10	16.10	4.00	4.00	1.5	1.70	.85
14	C—D	15.65	16.45	16.45	4.00	4.00	1.5	1.80	.90
16	A—B	17.40	18.40	18.40	4.00	4.00	1.75	1.80	.90
16	C—D	17.80	18.80	18.80	4.00	4.00	1.75	1.90	1.00
18	A—B	19.50	20.50	20.50	4.00	4.00	1.75	1.90	.95
18	C—D	19.92	20.92	20.92	4.00	4.00	1.75	2.10	1.05
20	A—B	21.60	22.60	22.60	4.00	4.00	1.75	2.00	1.00
20	C—D	22.06	23.06	23.06	4.00	4.00	1.75	2.30	1.15
24	A—B	25.80	26.80	26.80	4.00	4.00	2.00	2.10	1.05
24	C—D	26.32	27.32	27.32	4.00	4.00	2.00	2.50	1.25
30	A	31.74	32.74	32.74	4.50	4.50	2.00	2.30	1.15
30	B	32.00	33.00	33.00	4.50	4.50	2.00	2.30	1.15
30	C	32.40	33.40	33.40	4.50	4.50	2.00	2.60	1.32
30	D	32.74	33.74	33.74	4.50	4.50	2.00	3.00	1.50
36	A	37.96	38.96	38.96	4.50	4.50	2.00	2.50	1.25
36	B	38.30	39.30	39.30	4.50	4.50	2.00	2.80	1.40
36	C	38.70	39.70	39.70	4.50	4.50	2.00	3.10	1.60
36	D	39.16	40.16	40.16	4.50	4.50	2.00	3.40	1.80
42	A	44.20	45.20	45.20	5.00	5.00	2.00	2.80	1.40
42	B	44.50	45.50	45.50	5.00	5.00	2.00	3.00	1.50
42	C	45.10	46.10	46.10	5.00	5.00	2.00	3.40	1.75
42	D	45.58	46.58	46.58	5.00	5.00	2.00	3.80	1.95
48	A	50.50	51.50	51.50	5.00	5.00	2.00	3.00	1.50
48	B	50.80	51.80	51.80	5.00	5.00	2.00	3.30	1.65
48	C	51.40	52.40	52.40	5.00	5.00	2.00	3.80	1.95
48	D	51.98	52.98	52.98	5.00	5.00	2.00	4.20	2.20
54	A	56.66	57.66	57.66	5.50	5.50	2.25	3.20	1.60
54	B	57.10	58.10	58.10	5.50	5.50	2.25	3.60	1.80
54	C	57.80	58.80	58.80	5.50	5.50	2.25	4.00	2.15
54	D	58.40	59.40	59.40	5.50	5.50	2.25	4.40	2.45
60	A	62.80	63.80	63.80	5.50	5.50	2.25	3.40	1.70
60	B	63.40	64.40	64.40	5.50	5.50	2.25	3.70	1.90
60	C	64.20	65.20	65.20	5.50	5.50	2.25	4.20	2.25
60	D	64.82	65.82	65.82	5.50	5.50	2.25	4.70	2.60
72	A	75.34	76.34	76.34	5.50	5.50	2.25	3.80	1.87
72	B	76.00	77.00	77.00	5.50	5.50	2.25	4.20	2.20
72	C	76.88	77.88	77.88	5.50	5.50	2.25	4.60	2.64
84	A	87.54	88.54	88.54	5.50	5.50	2.50	4.10	2.10
84	B	88.54	89.54	89.54	5.50	5.50	2.50	4.50	2.60



Standard turned and bored pipe, bell and spigot; 4 inches to 24 inches sizes. Outside contour of bell is the same as on standard water pipe.

D dimensions vary for different pipe sizes. Particulars on application.

Standard Thicknesses and Weights of Cast Iron Pipe

Bell and Spigot Pipe. Turned and Bored Pipe

Table No. 2. Classes A, B, C, D

Terminals for Code Words Indicate Pipe Diameters	Nominal Inside Diam., In.	Code Words B. and S. Pipe, **Abac** T. and B. Pipe, **Abed**			Code Words B. and S. Pipe, **Abif** T. and B. Pipe, **Abog**			Code Words B. and S. Pipe, **Abul** T. and B. Pipe, **Acad**			Code Words B. and S. Pipe, **Acef** T. and B. Pipe, **Acoi**			Approximate Pounds Lead per Joint 2 Inches Thick	Approximate Pounds Hemp per Joint	Nominal Inside Diam., In.
		Class A 100-Foot Head 43 Pounds Pressure			Class B 200-Foot Head 86 Pounds Pressure			Class C 300-Foot Head 130 Pounds Pressure			Class D 400-Foot Head 173 Pounds Pressure					
		Thickness Inches	Pounds per		Thickness Inches	Pounds per		Thickness Inches	Pounds per		Thickness Inches	Pounds per				
			Foot	Length		Foot	Length		Foot	Length		Foot	Length			
aca .	3	.39	14.5	175	.42	16.2	194	.45	17.1	205	.48	18.0	216	6.00	.18	3
ame .	4	.42	20.0	240	.45	21.7	260	.48	23.3	280	.52	25.0	300	7.50	.21	4
atore	6	.44	30.8	370	.48	33.3	400	.51	35.8	430	.55	38.3	460	10.25	.31	6
avel .	8	.46	42.9	515	.51	47.5	570	.56	52.1	625	.60	55.8	670	13.25	.44	8
arca .	10	.50	57.1	685	.57	63.8	765	.62	70.8	850	.68	76.7	920	16.00	.53	10
aril .	12	.54	72.5	870	.62	82.1	985	.68	91.7	1100	.75	100.0	1200	19.00	.61	12
abaris	14	.57	89.6	1075	.66	102.5	1230	.74	116.7	1400	.82	129.2	1550	22.00	.81	14
beram	16	.60	108.3	1300	.70	125.0	1500	.80	143.8	1725	.89	158.3	1900	30.00	.94	16
bell .	18	.64	129.2	1550	.75	150.0	1800	.87	175.0	2100	.96	191.7	2300	33.80	1.00	18
bril .	20	.67	150.0	1800	.80	175.0	2100	.92	208.3	2500	1.03	229.2	2750	37.00	1.25	20
dicort	24	.76	204.2	2450	.89	233.3	2800	1.04	279.2	3350	1.16	306.7	3680	44.00	1.50	24
engra	30	.88	291.7	3500	1.03	333.3	4000	1.20	400.0	4800	1.37	450.0	5400	54.25	2.06	30
lculo	36	.99	391.7	4700	1.15	454.2	5450	1.36	545.8	6550	1.58	625.0	7500	64.75	3.00	36
lieu .	42	1.10	512.5	6150	1.28	591.7	7100	1.54	716.7	8600	1.78	825.0	9900	75.25	3.62	42
tras .	48	1.26	666.7	8000	1.42	750.0	9000	1.71	908.3	10900	1.96	1050.0	12600	85.50	4.37	48
ter .	54	1.35	800.0	9600	1.55	933.3	11200	1.90	1141.7	13700	2.23	1341.7	16100	97.60	6.25	54
tus .	60	1.39	916.7	11000	1.67	1104.2	13250	2.00	1341.7	16100	2.38	1583.3	19000	108.30	8.25	60
ura .	72	1.62	1283.4	15400	1.95	1545.8	18550	2.39	1904.2	22850	....	.....	.....	128.00	12.50	72
une .	84	1.72	1633.4	19600	2.22	2104.2	25250	....	.....	.....	....	.....	.....	147.00	15.00	84

All lengths to lay 12 feet. All weights are approximate; those per foot include allowance for bell; those per length include standard bells; proportionate allowance to be made for any variation from the standard length.

All pipe are tested by water pressure, as per Section 14 of Standard Specifications.

Turned and bored pipe made to order only.

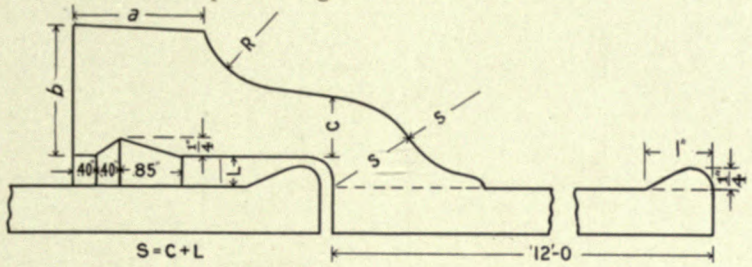
In telegraphing, to indicate kind and size, combine code words with terminals in first column, thus: 12-inch, Class B bell and spigot pipe = **Ablfaril**.

Cast Iron Pipe and Special Castings

For High Pressure Service

Table No. 3

General Dimensions of Pipe. High Pressure Service. Classes E, F, G, H



Nominal Diameter Inches	Classes	Actual Outside Diameter Inches	Diameter of Sockets	Depth of Sockets	A	B	C	R	Nominal Diameter Inches
			Pipe and Specials	Pipe and Specials					
6	E—F	7.22	8.02	4.00	1.50	1.75	.75	1.10	6
6	G—H	7.38	8.18	4.00	1.50	1.85	.85	1.10	6
8	E—F	9.42	10.22	4.00	1.50	1.85	.85	1.10	8
8	G—H	9.60	10.40	4.00	1.50	1.95	.95	1.10	8
10	E—F	11.60	12.40	4.50	1.75	1.95	.95	1.10	10
10	G—H	11.84	12.64	4.50	1.75	2.05	1.05	1.10	10
12	E—F	13.78	14.58	4.50	1.75	2.05	1.05	1.10	12
12	G—H	14.08	14.88	4.50	1.75	2.20	1.20	1.10	12
14	E—F	15.98	16.78	4.50	2.00	2.15	1.15	1.10	14
14	G—H	16.32	17.12	4.50	2.00	2.35	1.35	1.10	14
16	E—F	18.16	18.96	4.50	2.00	2.30	1.25	1.15	16
16	G—H	18.54	19.34	4.50	2.00	2.55	1.45	1.15	16
18	E—F	20.34	21.14	4.50	2.25	2.45	1.40	1.15	18
18	G—H	20.78	21.58	4.50	2.25	2.75	1.65	1.15	18
20	E—F	22.54	23.34	4.50	2.25	2.55	1.50	1.15	20
20	G—H	23.02	23.82	4.50	2.25	2.85	1.75	1.20	20
24	E—F	26.90	27.90	5.00	2.25	2.85	1.70	1.20	24
30	E	33.10	34.10	5.00	2.25	3.25	1.80	1.50	30
30	F	33.46	34.46	5.00	2.25	3.50	2.00	1.55	30
36	E	39.60	40.60	5.00	2.25	3.70	2.05	1.70	36
36	F	40.04	41.04	5.00	2.25	4.00	2.30	1.80	36

Within a comparatively few years the growth of cities and the increasing demands of manufacturing and mining districts and of railways, has developed a steadily increasing demand for cast iron pipe for high pressure service. On pages 27 to 30 will be found some notes regarding independent high pressure fire mains, which are now regarded essential in all important or congested sections of cities, and which through decreased fire losses and costs of insurance, more than pay their way. While independent water supplies are often installed under 100 pounds or more working pressure, for railways, mines and large manufacturing plants, they are as often needed at locations which can only be reached through heavy force mains, as at points where a gravity supply requires heavy pipe for the resulting pressures. Thus, aside from its use for independent fire line service, no

Standard Thicknesses and Weights of Cast Iron Pipe for Fire Lines and Other High Pressure Service

Table No. 4. Classes E, F, G, H

Size		In Telegraphing, to Indicate Class and Size, Combine Code Words with Terminals in First Column, thus 12-Inch, Class E = **Acumarii**												Lead	Hemp	Size
Terminals for Code Words Indicate Pipe Diameters	Nominal Inside Diameter Inches	Code Word **Acum** Class E 500-Foot Head 217 Pounds Pressure			Code Word **Adab** Class F 600-Foot Head 260 Pounds Pressure			Code Word **Adeg** Class G 700-Foot Head 304 Pounds Pressure			Code Word **Adil** Class H 800-Foot Head 347 Pounds Pressure			Approximate Pounds of Lead per Joint	Approximate Pounds of Hemp per Joint	Nominal Inside Diameter Inches
		Thickness Inches	Pounds per Foot	Pounds per Length	Thickness Inches	Pounds per Foot	Pounds per Length	Thickness Inches	Pounds per Foot	Pounds per Length	Thickness Inches	Pounds per Foot	Pounds per Length			
atore	6	.58	41.7	500	.61	43.3	520	.65	47.1	565	.69	49.6	595	12.3	.31	6
avel .	8	.66	61.7	740	.71	65.7	790	.75	70.8	850	.80	75.0	900	15.8	.44	8
arca .	10	.74	86.3	1035	.80	92.1	1105	.86	100.9	1210	.92	106.7	1280	19.2	.53	10
aril .	12	.82	113.8	1365	.89	122.1	1465	.97	135.4	1625	1.04	143.8	1725	22.7	.62	12
abaris	14	.90	145.0	1740	.99	157.5	1890	1.07	174.2	2090	1.16	186.7	2240	26.2	.83	14
beran	16	.98	179.6	2155	1.08	195.4	2345	1.18	219.2	2620	1.27	232.5	2790	35.9	.97	16
bell .	18	1.07	220.4	2645	1.17	238.4	2860	1.28	267.1	3205	1.39	286.7	3440	40.3	1.05	18
brii .	20	1.15	263.0	3155	1.27	286.3	3435	1.39	320.8	3850	1.51	344.6	4135	44.5	1.33	20
dicort	24	1.31	359.6	4315	1.45	392.9	4715	....	.....	....	....	.....	....	53.1	1.60	24
engra	30	1.55	521.7	6260	1.73	585.4	7025	....	.....	....	....	.....	....	65.2	2.15	30
iculo .	36	1.80	725.0	8700	2.02	820.0	9840	....	.....	....	....	.....	....	77.9	3.20	36

All lengths to lay 12 feet. All weights are approximate; those per foot include allowance for bell; those per length include standard sockets; proportionate allowance to be made for any variation from the standard length. All high pressure pipe are tested by water pressure to 500 pounds, at the works.

For Special Castings for High Pressure Pipe see pages 98 to 101 and Table No. 3. One class of special castings is provided for Classes E and F pipe, and one class of special castings for Classes G and H pipe, 6 to 24 inches inclusive. One class of special castings is supplied for each class of 30 and 36 inch pipe.

small proportion of the demand for high pressure pipe comes from these other sources; and for such service and as supplementing the classes for lower pressures, we offer our standard E, F, G and H pipe per Tables No. 3 and No. 4. When required, the bell may be ordered with one or two half round lead grooves instead of the standard shown. Standard special castings are provided as per foot note under Table No. 4. Certain castings, notably some of the tees and crosses in which the metal is cut away by the arm openings, are made of steel, as required. A line of high pressure flange pipe and specials for corresponding high pressure service is provided. See pages 102 to 104.

In Table No. 5 we offer a full line of flexible joint pipe which will be found well adapted to ordinary conditions. The two designs are the same as to general dimensions and outside contour of the flexible joint bell, differing mainly on the inside of the bell and at the spigot ends. Type No. 1 is similar in some respects to the old Ward joint, while Type No. 2, the Metropolitan joint, is a newer form, in which the lead remains in the bell when the joint is deflected, and does not work outside the bell, as in the older joint.

When ordering flexible joint pipe, Types No. 1 and No. 2, provision should be made for connecting each end with the bell and spigot lines. (See continuation, page 48.)

General Dimensions, Thicknesses and Weights Standard Flexible Joint Pipe

Type No. 1. Code Word, **Adom**

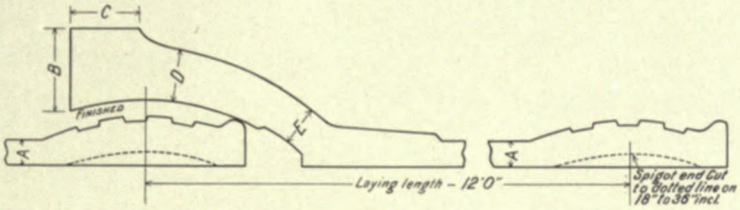
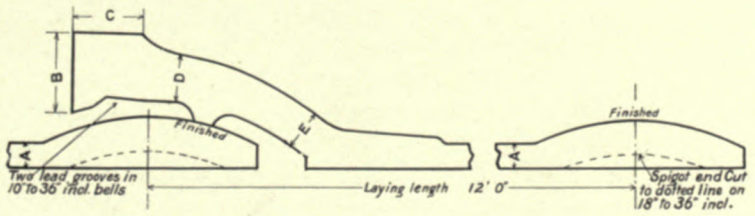


TABLE NO. 5

Code Terminal	Size Inches	Class	A	B	C	D	E	Weight per Length Pounds	Lead per Solid Joint Pounds	
									Type 1	Type 2
atore . .	6	B	.48	1.56	1.37	1.00	.87	503	11.9	9.0
aras . .	6	D	.55	1.56	1 37	1.00	.87	555	11.9	9.0
avel . .	8	B	.51	1.81	1.56	1.12	.94	673	19	14
anha . .	8	D	.60	1.81	1.56	1.12	.94	780	19	14
arca . .	10	B	.57	2.06	1.75	1.18	1.00	947	28	22
anis . .	10	D	.68	2.06	1.75	1.18	1.00	1080	28	22
aril . .	12	B	.62	2.25	1.87	1.25	1.06	1210	49	39
amus . .	12	D	.75	2.25	1.87	1.25	1.06	1400	49	39
abaris .	14	B	.66	2.50	2.00	1.31	1.12	1450	64	51
abor . .	14	D	.82	2.50	2.00	1.31	1.12	1750	64	51
beran . .	16	B	.70	2.75	2.12	1.43	1.25	1862	76	60
bevel . .	16	D	.89	2.75	2.12	1.43	1.25	2250	76	60
bell . .	18	B	.75	2.87	2.25	1.56	1.31	2300	91	73
bero . .	18	D	.96	2.87	2.25	1.56	1.31	2760	91	73
bril . .	20	B	.80	3.12	2.37	1.62	1.37	2625	112	92
balk . .	20	D	1.03	3.12	2.37	1.62	1.37	3200	112	92
dicort . .	24	B	.89	3.37	2.68	1.75	1.50	3534	136	112
dean . .	24	D	1.16	3.37	2.68	1.75	1.50	4290	136	112
engra . .	30	B	1.03	3.87	3.18	2.12	1.72	5067	181	146
erin . .	30	D	1.37	3.87	3.18	2.12	1.72	6360	181	146
iculo . .	36	B	1.15	4.12	3.50	2.50	1.94	6063	225	177
icar . .	36	D	1.58	4.12	3.50	2.50	1.94	7900	225	177

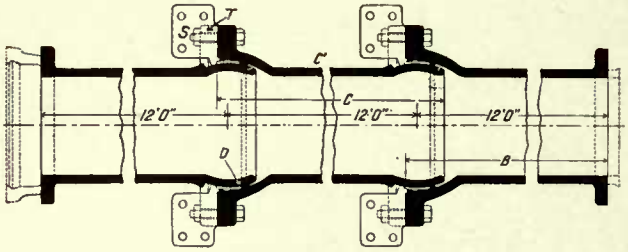
Type No. 2. Code Word, **Afag**



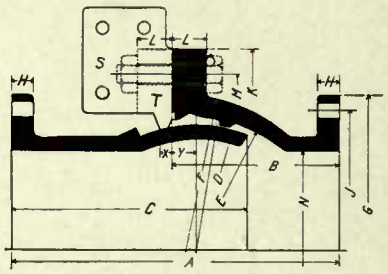
Deflection about 13 degrees. Either type made to order only. All weights are approximate. For heavy service see Types No. 3 and No. 4.

LIBRARY OF THE UNIVERSITY OF

General Dimensions, Thicknesses and Weights Standard Flexible Joint Pipe—Cont.



Type No. 3



Type No. 4

Table No. 6

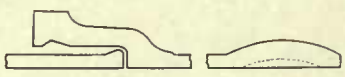
Full Lengths — Short Lengths

Dimensions Common to Nos 3 and 4					Type No. 3—Code, **Afel**				Type No. 4—Code, **Afim**					
Sizes Inches	Class D Thickness	Rad. D	Gun Metal Bolts in		Code Terminal	Lengths		Approximate Pounds Section C	Code Terminal	Lengths			Approximate Pounds per Joint	Size Inches
			Joint S	Flange T		B	C			A	B	C		
12	.75	15.00	6	16	**aril**	145.13	148.38	1508	**amus**	20	10.13	14.25	617	12
14	.82	17.50	6	18	**abaris**	145.75	149.25	1922	**abor**	21	11.25	15.00	786	14
16	.89	19.75	6	20	**beran**	145.81	149.81	2384	**bevel**	22	12.06	15.75	995	16
18	.96	22.13	6	22	**bell**	146.00	150.50	2809	**bero**	24	13.50	17.00	1157	18
20	1.03	24.88	6	24	**bril**	146.20	151.08	3454	**balk**	26	14.45	18.63	1529	20
24	1.16	29.06	6	28	**dicort**	146.20	151.95	4646	**dean**	28	15.45	20.50	2101	24
30	1.37	35.75	6	34	**engra**	146.75	153.50	6817	**erin**	33	19.00	23.50	3004	30
36	1.58	42.50	6	40	**iculo**	147.00	155.00	9798	**icar**	38	21.00	28.00	5109	36

L—4858

Weights approximate only, and include gun metal bolts per table, Type No. 3 end sections may be ordered bell or spigot instead of flange if desired. Flange dimensions Class D. Bolts for end flanges furnished to order only—not included with the castings. Type No. 4 joints are furnished complete with lead calked bell and bolted collar, ready for use.

Thus it is well to have, in addition to the required number of flexible joint lengths, one length with flexible bell and ordinary spigot, and one length with ordinary bell and



flexible spigot. These latter may also be ordered in pairs, to use in laying a line in shallow water with standard bell and spigot pipe, so as to secure a flexible joint in every three or four joints.

For important lines laid in deep or swift water, especially if under heavy pressure, we offer flexible joints of our Types No. 3 and No. 4. As will be seen from the designs, these are heavier joints, with flanged collars secured by gun metal bolts, which cannot readily pull apart. Type No. 3 is a full length pipe, having this form of joint, as listed in Table No. 6. Type No. 4 is a joint of the same design, of short length, as used in special locations with flange pipe. When ordering Type No. 3 or No. 4 joints, provision should also be made as to ordering connecting end pieces, and all underwater flanged pipe joints should preferably have bronze or gun metal bolts.

Owing to the longer bells and spigots, the flexible joint pipe are heavier than

corresponding sizes and classes of bell and spigot pipe, and owing to the machine work upon them, take nearly twice as long to manufacture as regular bell and spigot pipe. Not infrequently much is gained in laying submerged lines during the low water, and when the streams are free from ice. Hence, in planning such mains, ample time should be allowed, that the pipe may be made up in due season.

The utmost care should be exercised in laying flexible joint pipe, to insure thoroughly made joints, which when fully calked should be moved within the limits of deflection before the next pipe is inserted and the joint submerged.

Table No. 7

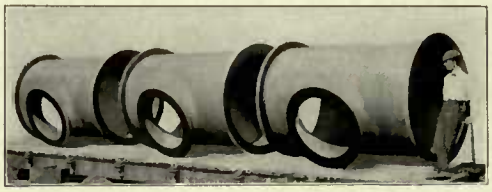
Lead in Bell and Spigot Pipe Joints

Nominal Diameter Inches	Approximate Pounds Lead in Pipe Joint 2 Inches Deep	Approximate Pounds Lead in Pipe Joint 2¼ Inches Deep	Approximate Pounds Lead in Pipe Joint 2½ Inches Deep	Approximate Pounds Lead in Solid Pipe Joint
3	6.00	6.50	7.00	10.25
4	7.50	8.00	8.75	13.00
6	10.25	11.25	12.25	18.00
8	13.25	14.50	15.75	23.00
10	16.00	17.50	19.00	31.00
12	19.00	20.50	22.50	36.50
14	22.00	24.00	26.00	38.50
16	30.00	33.00	35.75	64.75
18	33.80	36.90	40.00	72.00
20	37.00	40.50	44.00	80.00
24	44.00	48.00	52.50	95.00
30	54.25	59.50	64.75	117.50
36	64.75	71.00	77.25	140.25
42	75.25	78.75	85.50	155.25
48	85.50	94.00	102.25	202.25
54	97.60	107.10	116.60	238.60
60	108.30	118.80	129.50	255.50
72	128.00	140.50	153.00	302.50
84	147.00	161.50	175.60	348.00

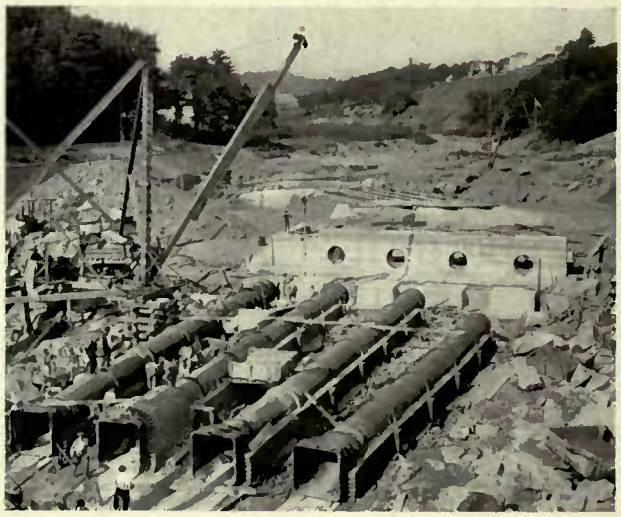
The above table gives the calculated weight of lead required for pipe joints, both with and without gasket. The weight of a cubic inch of lead is taken as 0.41 pound. An allowance has been made for lead to project beyond face of the bell for calking.

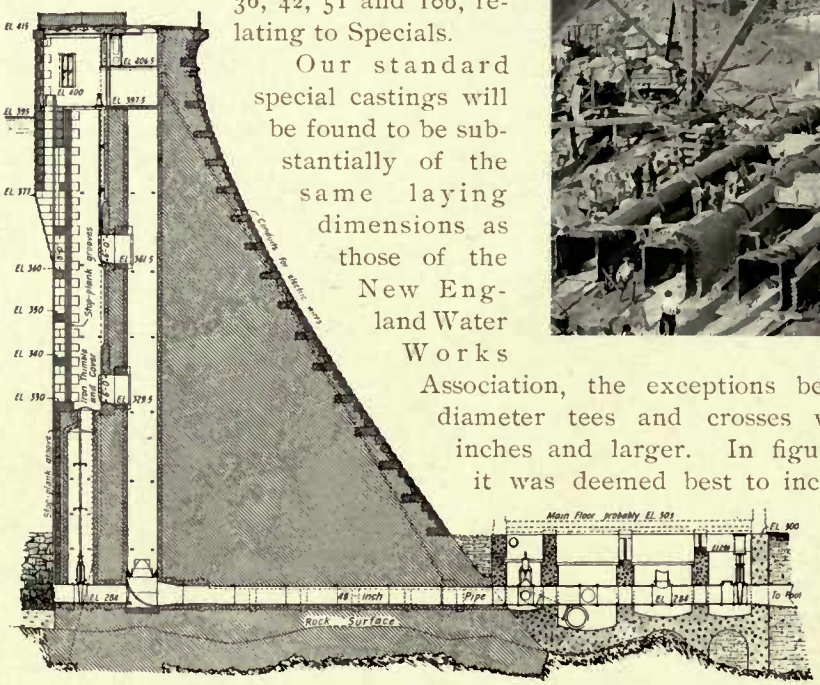
The specifications for pipes allow the lead space to vary from those given in tables, hence the weight of lead required for the joint may vary approximately 11 to 16 per cent. from weights given above.

Standard Special Castings

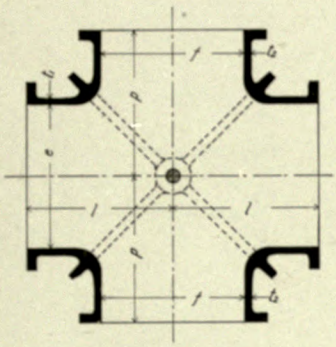


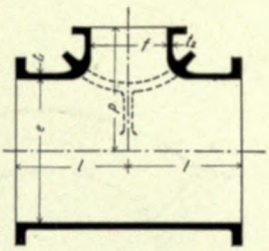
In designing pump house, reservoir gate house and other pipe connections it is hoped that engineers will incorporate in their drawings, as far as may be, special castings of standard dimensions as shown in the tables herein. This will enable us to furnish more promptly any special castings ordered of us, and greatly facilitate the filling of orders. While at each of our plants we make more or less special castings, at our Addyston, Burlington and Bessemer plants, we have large special foundry and machine shops, some of them of most recent and modern construction. Attention is again directed to clauses in Standard Specifications, pages 36 to 41 inclusive, as well as notes on pages 36, 42, 51 and 106, relating to Specials.





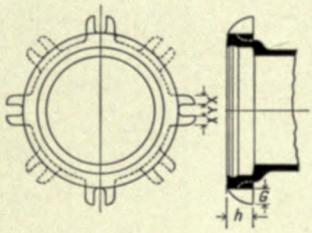
Our standard special castings will be found to be substantially of the same laying dimensions as those of the New England Water Works Association, the exceptions being mainly in the large diameter tees and crosses with branch openings 14 inches and larger. In figuring these larger castings it was deemed best to increase their laying lengths from 2 to 4 inches, to allow more metal in corner sections and clearance of run and branch bells. In producing the designs for special cast-

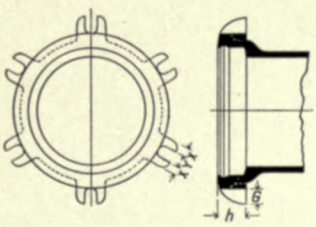




ings we have aimed to insure castings of ample strength; hence, many of the listed tees and crosses are provided with ribs, or are ribbed and bolted, or for heavy pressures, are made of steel. Such castings are not included with regular specials, bell and spigot or flange, and prices will be quoted only on receipt of lists specifying castings required. Bolted castings are made up with steel bolts protected by brass tubing, or, preferably, with gun metal bolts. By regular bell and spigot or flange specials, is meant the ordinary run of such castings. Bolted Y branches and breeches pipe, and all tongue and groove or tongue and recess flanged castings are classed as extras.

4 Lugs, 12–14 inches
8 Lugs, 42–60 inches





6 Lugs, 16–36 inches

Standard Lugs. Number and Weights of Lugs on Outlets of Different Sizes

Table No. 8

Code Terminal	Nominal Diameter Outlet Inches	Number of Pairs of Lugs	Approximate Weight Lugs on One Bell Pounds	Code Terminal	Nominal Diameter Outlet Inches	Number of Pairs of Lugs	Approximate Weight Lugs on One Bell Pounds
aril	12	4	32	**engra**	30	6	80
abaris	14	4	32	**iculo**	36	6	80
beran	16	6	56	**lieu**	42	8	111
bell	18	6	56	**tras**	48	8	114
bril	20	6	56	**ura**	54	8	134
dicort	24	6	56	**une**	60	8	137

L—5236

Two pairs of lugs are placed on the vertical axis of each bell, the others at equal distances around circumference. h is equal depth of bell on all sizes.

G equals 2.50 inches, X equals 1.25 inches, Y equals 1.63 inches for 12 to 24 inches inclusive.

G equals 3.00 inches, X equals 1.50 inches, Y equals 2.00 inches for 30 to 60 inches inclusive.

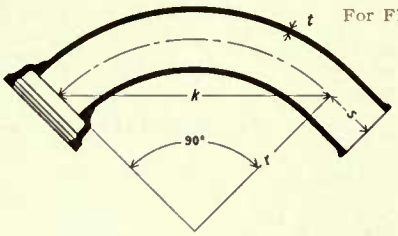
Standard lugs of the form and number of pairs here shown, may be ordered on bells of pipe and specials 12 inches in diameter and larger. An extra charge is made for pipe and castings with lugs. Such castings are made only to order.

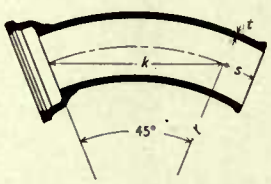
All weights are approximate.

Standard Special Castings for Water

Standard Curves, Bell and Spigot, 1/4, 1/8, 1/16

For Flanged Special Castings, see pages 87 to 97





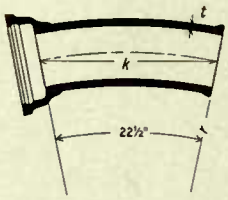


Table No. 9

1/4 Curves—Code, **Afup**						
Code Terminal	Nominal Diam., In.	Class	Dimensions, Inches			Approx. Weight Pounds
			t	r	k	
ame	4	D	.52	16	22.60	82
atore	6	D	.55	16	22.60	130
avel	8	D	.60	16	22.60	200
arca	10	D	.68	16	22.60	278
aril	12	D	.75	16	22.60	366
anos	14	B	.66	18	25.50	406
abor	14	D	.82	18	25.50	504
basse	16	B	.70	24	34.00	594
bara	16	D	.89	24	34.00	750
belge	18	B	.75	24	34.00	710
balk	18	D	.96	24	34.00	888
bucu	20	B	.80	24	34.00	840
bonne	20	D	1.03	24	34.00	1070
deros	24	B	.89	30	42.40	1290
della	24	D	1.16	30	42.40	1656
etra	30	A	.88	36	50.90	1814
etros	30	B	1.03	36	50.90	2082
enbin	30	C	1.20	36	50.90	2454
engo	30	D	1.37	36	50.90	2836
igar	36	A	.99	48	67.90	2964
icell	36	B	1.15	48	67.90	3500
icet	36	C	1.36	48	67.90	4120
illus	36	D	1.58	48	67.90	4820

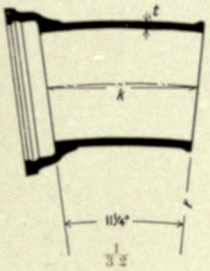
S=8 inches on sizes 4 and 6 inches. L—1101
S=10 inches on sizes 8 inches.
S=12 inches on sizes 10 to 36 inches.
All weights are approximate.

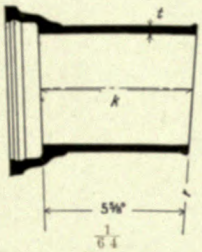
Table No. 10

Nominal Diam., In.	Class	t	1/8 Curves—Code, **Agal**			1/16 Curves Code, **Agem**		
			Code Terminal	r	k	Approx. Weight Pounds	r	k	Approx. Weight Pounds
4	D	.52	**ame**	24	18.40	66	48	18.70	66
6	D	.55	**atore**	24	18.40	105	48	18.70	105
8	D	.60	**avel**	24	18.40	150	48	18.70	150
10	D	.68	**arca**	24	18.40	202	48	18.70	202
12	D	.75	**aril**	24	18.40	265	48	18.70	265
14	B	.66	**anos**	36	27.60	359	72	28.10	312
14	D	.82	**abor**	36	27.60	442	72	28.10	382
16	B	.70	**basse**	36	27.60	445	72	28.10	388
16	D	.89	**bara**	36	27.60	558	72	28.10	484
18	B	.75	**belge**	36	27.60	533	72	28.10	464
18	D	.96	**balk**	36	27.60	663	72	28.10	574
20	B	.80	**bucu**	48	36.70	758	96	37.50	676
20	D	1.03	**bonne**	48	36.70	964	96	37.50	858
24	B	.89	**deros**	60	45.90	1181	120	46.80	1072
24	D	1.16	**della**	60	45.90	1515	120	46.80	1372
30	A	.88	**etra**	60	45.90	1475	120	46.80	1342
30	B	1.03	**etros**	60	45.90	1684	120	46.80	1528
30	C	1.20	**enbin**	60	45.90	1983	120	46.80	1800
30	D	1.37	**engo**	60	45.90	2291	120	46.80	2080
36	A	.99	**igar**	90	68.90	2472	180	70.20	2472
36	B	1.15	**icell**	90	68.90	2916	180	70.20	2916
36	C	1.36	**icet**	90	68.90	3430	180	70.20	3430
36	D	1.58	**illus**	90	68.90	4012	180	70.20	4012
42	A	1.10	**lapel**	90	68.90	3286	180	70.20	3286
42	B	1.28	**larel**	90	68.90	3778	180	70.20	3778
42	C	1.54	**laron**	90	68.90	4600	180	70.20	4600
42	D	1.78	**latest**	90	68.90	5360	180	70.20	5360
48	A	1.26	**ocet**	90	68.90	4230	180	70.20	4230
48	B	1.42	**omen**	90	68.90	4820	180	70.20	4820
48	C	1.71	**ofer**	90	68.90	5796	180	70.20	5796
48	D	1.96	**odis**	90	68.90	6750	180	70.20	6750
54	A	1.35	**same**	90	68.90	5180	180	70.20	5180
54	B	1.55	**sand**	90	68.90	5990	180	70.20	5990
54	C	1.90	**sone**	90	68.90	7330	180	70.20	7330
54	D	1.23	**slca**	90	68.90	8620	180	70.20	8620
60	A	1.39	**ulode**	90	68.90	5990	180	70.20	5990
60	B	1.67	**ufre**	90	68.90	7130	180	70.20	7130
60	C	2.00	**ufon**	90	68.90	8590	180	70.20	8590
60	D	2.38	**udrey**	90	68.90	10240	180	70.20	10240

S=6 inches on 1/8 Curves on sizes 4 to 30 inches inclusive. L—1101
S=6 inches on 1/16 Curves on sizes 4 to 12 inches inclusive.

Standard Special Castings for Water





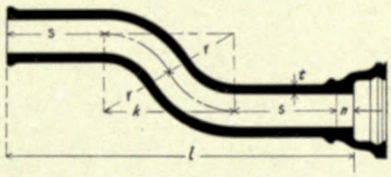


TABLE NO. 11. Standard Curves, Bell and Spigot

Nominal Diameter, Inches	Class	t	1/32 Curves—Code, **Agop**				1/64 Curves—Code, **Agus**		
			Code Terminal	r	k	Approx. Weight Pounds	r	k	Approx. Weight Pounds
4	D	.52	**ame**	120	23.52	66			
6	D	.55	**atore**	120	23.52	104			
8	D	.60	**avel**	120	23.52	150			
10	D	.68	**arca**	120	23.52	192			
12	D	.75	**aril**	120	23.52	250			
14	B	.66	**anos**	180	35.28	364			
14	D	.82	**abor**	180	35.28	450			
16	B	.70	**basse**	180	35.28	453			
16	D	.89	**bara**	180	35.28	570			
18	B	.75	**belge**	180	35.28	542			
18	D	.96	**balk**	180	35.28	674			
20	B	.80	**bucu**	240	47.05	808	480	47.10	808
20	D	1.03	**bonne**	240	47.05	1028	480	47.10	1028
24	B	.89	**deros**	240	47.05	1080	480	47.10	1080
24	D	1.16	**della**	240	47.05	1380	480	47.10	1380
30	A	.88	**etra**	240	47.05	1350	480	47.10	1350
30	B	1.03	**etros**	240	47.05	1540	480	47.10	1540
30	C	1.20	**enbin**	240	47.05	1810	480	47.10	1810
30	D	1.37	**engo**	240	47.05	2090	480	47.10	2090
36	A	.99	**igar**	240	47.05	1790	480	47.10	1790
36	B	1.15	**icell**	240	47.05	2100	480	47.10	2100
36	C	1.36	**icet**	240	47.05	2470	480	47.10	2470
36	D	1.58	**illus**	240	47.05	2880	480	47.10	2880
42	A	1.10	**lapel**	240	47.05	2380	480	47.10	2380
42	B	1.28	**laret**	240	47.05	2720	480	47.10	2720
42	C	1.54	**laron**	240	47.05	3310	480	47.10	3310
42	D	1.78	**latest**	240	47.05	3850	480	47.10	3850
48	A	1.26	**ocet**	240	47.05	3150	480	47.10	3150
48	B	1.42	**omen**	240	47.05	3480	480	47.10	3480
48	C	1.71	**ofer**	240	47.05	4170	480	47.10	4170
48	D	1.96	**odis**	240	47.05	4860	480	47.10	4860
54	A	1.35	**same**	240	47.05	3750	480	47.10	3750
54	B	1.55	**sand**	240	47.05	4330	480	47.10	4330
54	C	1.90	**sone**	240	47.05	5290	480	47.10	5290
54	D	2.23	**sica**	240	47.05	6220	480	47.10	6220
60	A	1.39	**ulode**	240	47.05	4340	480	47.10	4340
60	B	1.67	**ufre**	240	47.05	5140	480	47.10	5140
60	C	2.00	**ufon**	240	47.05	6200	480	47.10	6200
60	D	2.38	**udrey**	240	47.05	7400	480	47.10	7400

L—1101

All weights are approximate.

TABLE NO. 12. Standard Offsets

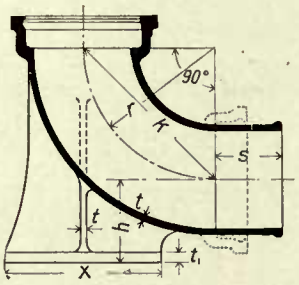
Code Word, **Alam**

Code Terminal	Nominal Diam., Inches	Class	r	l	Approx. Weight Pounds
ame	4	D	8	35.85	91
atore	6	D	14	46.25	183
avel	8	D	15	48.00	280
arca	10	D	16	49.70	390
aril	12	D	17	51.45	530
anos	14	B	18	53.70	555
abor	14	D	18	53.70	695
basse	16	B	19	55.40	708
bara	16	D	19	55.40	900

Nominal Diameter Inches	Class	t	k	s	n
4	D	.52	13.85	10.00	2.00
6	D	.55	24.25	10.00	2.00
8	D	.60	26.00	10.00	2.00
10	D	.68	27.70	10.00	2.00
12	D	.75	29.45	10.00	2.00
14	B	.66	31.20	10.00	2.50
14	D	.82	31.20	10.00	2.50
16	B	.70	32.90	10.00	2.50
16	D	.89	32.90	10.00	2.50

L—5324

Standard Special Castings for Water



¼ Curves with Base

Table No. 13. Code Word, **Alen**

Code Terminal	Nominal Diameter Inches	Class	t	r	k	s	h	Approx. Weight Pounds
ame	4	D	.52	16	22.60	8	5.50	141
atore	6	D	.55	16	22.60	8	6.50	214
avel	8	D	.60	16	22.60	10	7.50	309
arca	10	D	.68	16	22.60	12	9.00	436
aril	12	D	.75	16	22.60	12	10.00	579
anos	14	B	.66	18	25.50	12	12.00	717
abor	14	D	.82	18	25.50	12	12.00	815
basse	16	B	.70	24	34.00	12	13.00	1053
bara	16	D	.89	24	34.00	12	13.00	1209
belge	18	B	.75	24	34.00	12	14.00	1264
balk	18	D	.96	24	34.00	12	14.00	1442
bucu	20	B	.80	24	34.00	12	15.00	1619
bonne	20	D	1.03	24	34.00	12	15.00	1849
deros	24	B	.89	30	42.40	12	17.50	2379
delia	24	D	1.16	30	42.40	12	17.50	2745
etra	30	A	.88	36	50.90	12	21.00	3718
etros	30	B	1.03	36	50.90	12	21.00	3986
enbin	30	C	1.20	36	50.90	12	21.00	4358
engo	30	D	1.37	36	50.90	12	21.00	4740
igar	36	A	.99	48	67.90	12	24.50	6002
iceil	36	B	1.15	48	67.90	12	24.50	6538
icet	36	C	1.36	48	67.90	12	24.50	7158
illus	36	D	1.58	48	67.90	12	24.50	7858

All weights are approximate.

L—5230

Standard Special Castings for Water

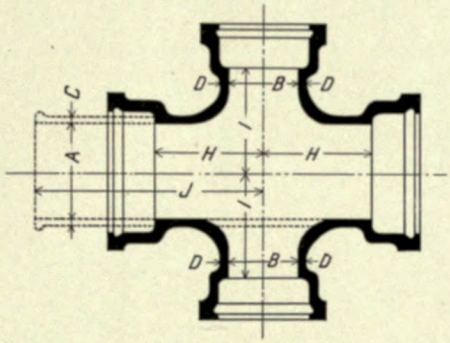


Table No. 14. Standard Branches

Code Stems over Weight Columns							Approximate Weights, Pounds			
							Code Stems			
Code Terminal	Nominal Diameter Inches		Class	Dimensions, Inches			Alip	Alos	Alut	Aman
							3-Way Branches		4-Way Branches	
	A	B		H	J	I	2 Bells	3 Bells	3 Bells	4 Bells
arent	3	3	D	10	22	10	92	94	124	125
aca	4	3	D	11	23	11	121	120	153	153
ame	4	4	D	11	23	11	125	128	164	166
alizo	6	3	D	12	24	12	173	170	207	204
aras	6	4	D	12	24	12	185	183	223	221
atore	6	6	D	12	24	12	203	200	259	257
anha	8	4	D	13	25	13	262	255	301	294
atico	8	6	D	13	25	13	278	270	333	325
avel	8	8	D	13	25	13	301	294	378	372
afft	10	4	D	14	26	14	356	338	395	377
anion	10	6	D	14	26	14	371	352	424	406
anis	10	8	D	14	26	14	389	371	461	443
arca	10	10	D	14	26	14	414	395	511	493
aclie	12	4	D	15	27	15	473	445	514	486
amus	12	6	D	15	27	15	486	458	540	512
atum	12	8	D	15	27	15	502	474	573	545
acho	12	10	D	15	27	15	519	491	605	577
aril	12	12	D	15	27	15	540	512	651	623
abunt	14	4	B	16	28	16	485	480	535	530
andum	14	4	D	16	28	16	614	588	666	641
atur	14	6	B	16	28	16	500	495	560	555
avero	14	6	D	16	28	16	634	608	730	700
arizo	14	8	B	16	28	16	515	510	600	595
averi	14	8	D	16	28	16	662	636	787	761
arate	14	10	B	16	28	16	535	525	635	625
atorem	14	10	D	16	28	16	679	653	822	796
anos	14	12	B	16	28	16	560	550	680	670
abor	14	12	D	16	28	16	698	672	860	834
abaris	14	14	B	16	28	16	575	569	723	715
acity	14	14	D	16	28	16	750	724	938	963
arage	16	4	B	17	29	17	615	610	675	670

All weights are approximate.

L—1105

Standard Special Castings for Water

Table No. 14—Continued. Standard Branches

Code Terminal	Nominal Diameter Inches		Class	Dimensions, Inches			Approximate Weights, Pounds			
Code Stems over Weight Columns							Code Stems			
							Allp	Alos	Alut	Aman
							3-Way Branches		4-Way Branches	
	A	B		H	J	I	2 Bells	3 Bells	3 Bells	4 Bells
agno	16	4	D	17	29	17	783	760	864	841
avate	16	6	B	17	29	17	630	625	695	690
acibus	16	6	D	17	29	17	802	779	902	879
alite	16	8	B	17	29	17	645	640	730	725
atima	16	8	D	17	29	17	831	808	961	938
andos	16	10	B	17	29	17	660	655	760	755
barla	16	10	D	17	29	17	872	849	1042	1019
barot	16	12	B	17	29	17	685	680	805	800
basan	16	12	D	17	29	17	884	861	1066	1043
basse	16	14	B	17	29	17	695	690	825	820
bara	16	14	D	17	29	17	903	880	1104	1082
beran	16	16	B	17	29	17	729	727	904	901
bevel	16	16	D	17	29	17	991	969	1282	1259
bero	18	4	B	18	30	18	755	750	820	815
bias	18	4	D	18	30	18	953	927	1046	1020
biam	18	6	B	18	30	18	765	760	840	835
biolan	18	6	D	18	30	18	968	942	1075	1049
biate	18	8	B	18	30	18	780	775	870	865
bione	18	8	D	18	30	18	1000	974	1140	1114
bonca	18	10	B	18	30	18	795	790	900	895
bolla	18	10	D	18	30	18	1038	1012	1216	1190
brona	18	12	B	18	30	18	815	810	940	935
begi	18	12	D	18	30	18	1075	1049	1290	1264
belag	18	14	B	18	30	18	825	820	955	950
belas	18	14	D	18	30	18	1083	1057	1306	1280
belge	18	16	B	18	30	18	855	850	1020	1015
balk	18	16	D	18	30	18	1108	1082	1356	1330
bell	18	18	B	18	30	18	895	889	1101	1096
belon	18	18	D	18	30	18	1170	1144	1480	1454
belrod	20	4	B	19	31	19	923	916	1006	999
benk	20	4	D	19	31	19	1172	1148	1273	1248
beure	20	6	B	19	31	19	930	920	1010	1000
berd	20	6	D	19	31	19	1188	1164	1304	1280
biene	20	8	B	19	31	19	945	935	1035	1025
bill	20	8	D	19	31	19	1212	1188	1352	1328
binal	20	10	B	19	31	19	955	945	1060	1050
bini	20	10	D	19	31	19	1252	1227	1431	1407
bio	20	12	B	19	31	19	975	965	1100	1090
biros	20	12	D	19	31	19	1288	1263	1502	1479
brito	20	14	B	19	31	19	980	970	1110	1100
brom	20	14	D	19	31	19	1342	1318	1613	1588
buron	20	16	B	19	31	19	1010	1000	1170	1160
boroi	20	16	D	19	31	19	1347	1323	1622	1597
bucu	20	18	B	19	31	19	1035	1025	1225	1215
bonne	20	18	D	19	31	19	1365	1341	1658	1634
bril	20	20	B	19	31	19	1077	1070	1314	1307

All weights are approximate.

L—1105

Standard Special Castings for Water

Table No. 14—Continued. Standard Branches

Code Terminal	Nominal Diameter Inches		Class	Dimensions, Inches			Approximate Weights, Pounds			
Code Stems over Weight Columns							Code Stems			
							Alip	Alos	Alut	Aman
							3-Way Branches		4-Way Branches	
	A	B		H	J	I	2 Bells	3 Bells	3 Bells	4 Bells
bunt	20	20	D	19	31	19	1462	1438	1852	1828
back	24	6	B	21	33	21	1309	1289	1425	1405
biolus	24	6	D	21	33	21	1670	1637	1809	1775
buis	24	8	B	21	33	21	1323	1303	1453	1433
berto	24	8	D	21	33	21	1697	1664	1863	1830
borne	24	10	B	21	33	21	1341	1321	1489	1469
card	24	10	D	21	33	21	1732	1699	1933	1900
cana	24	12	B	21	33	21	1362	1342	1532	1511
carlo	24	12	D	21	33	21	1768	1735	2005	1972
cape	24	14	B	21	33	21	1402	1381	1609	1589
cift	24	14	D	21	33	21	1810	1777	2088	2055
cire	24	16	B	21	33	21	1443	1423	1694	1673
dea	24	16	D	21	33	21	1858	1825	2185	2151
del	24	18	B	21	33	21	1460	1440	1727	1706
deral	24	18	D	21	33	21	1885	1852	2238	2205
deros	24	20	B	21	33	21	1474	1454	1756	1736
della	24	20	D	21	33	21	2025	1991	2518	2484
dicort	24	24	B	21	33	21	1523	1503	1854	1834
digli	24	24	D	21	33	21	2146	2113	2727	2694
donia	30	6	A	13	25	24	1272	1300	1407	1434
dango	30	6	B	13	25	24	1433	1417	1580	1563
dorum	30	6	C	13	25	24	1693	1673	1870	1850
dabam	30	6	D	13	25	24	1934	1920	2113	2099
dage	30	8	A	14	26	24	1318	1346	1453	1481
dame	30	8	B	14	26	24	1482	1466	1624	1609
daria	30	8	C	14	26	24	1765	1745	1953	1934
dast	30	8	D	14	26	24	2004	1990	2182	2168
deaw	30	10	A	15	27	24	1369	1396	1512	1540
delag	30	10	B	15	27	24	1538	1521	1685	1668
dilas	30	10	C	15	27	24	1857	1837	2075	2056
dulf	30	10	D	15	27	24	2108	2094	2319	2306
deur	30	12	A	15	27	24	1395	1420	1555	1580
dra	30	12	B	15	27	24	1555	1540	1715	1700
dalt	30	12	C	15	27	24	1911	1891	2184	2164
dade	30	12	D	15	27	24	2154	2140	2411	2398
dangis	30	14	A	18	30	26	1547	1575	1737	1764
darb	30	14	B	18	30	26	1805	1789	2085	2069
dobs	30	14	C	18	30	26	2159	2140	2497	2477
dofen	30	14	D	18	30	26	2567	2553	3026	3013
dort	30	16	A	19	31	26	1648	1675	1805	1832
dalt	30	16	B	19	31	26	1899	1883	2200	2184
dean	30	16	C	19	31	26	2272	2253	2662	2642
dique	30	16	D	19	31	26	2692	2678	3206	3192
dering	30	18	A	20	34	26	1757	1741	2024	2007
dellos	30	18	B	20	34	26	2044	1976	2387	2318

Large diameter tees and crosses with ribs, or with ribs and bolted through flats when required. See page 51. L—1105
All weights are approximate.

Standard Special Castings for Water

TABLE No. 14—Continued. Standard Branches

Code Terminal	Nominal Diameter Inches A	Nominal Diameter Inches B	Class	Dimensions, Inches H	Dimensions, Inches J	Dimensions, Inches I	Approximate Weights, Pounds — Code Stems: Alip (3-Way Branches, 2 Bells)	Alip (3-Way Branches, 3 Bells)	Alut (4-Way Branches, 3 Bells)	Aman (4-Way Branches, 4 Bells)
ebam	30	18	C	20	34	26	2434	2353	2862	2781
entib	30	18	D	20	34	26	2805	2791	3361	3348
entls	30	20	A	21	36	26	1857	1818	2157	2118
eola	30	20	B	21	36	26	2182	2088	2584	2490
erem	30	20	C	21	36	26	2667	2555	3237	3126
etori	30	20	D	21	36	26	3041	2921	3657	3538
etra	30	24	A	23	38	26	1979	1940	2312	2274
etros	30	24	B	23	38	26	2313	2219	2742	2648
enbin	30	24	C	23	38	26	2847	2736	3474	3362
engo	30	24	D	23	38	26	3290	3170	4014	3895
engra	30	30	A	26	43	26	2212	2129	2602	2520
erin	30	30	B	26	43	26	2599	2453	3106	2960
ernol	30	30	C	26	43	26	3310	3137	4110	3937
ernu	30	30	D	26	43	26	3850	3660	4799	4609
erfen	36	8	A	14	26	27	1751	1777	1938	1963
erish	36	8	B	14	26	27	2055	2073	2268	2287
eone	36	8	C	14	26	27	2421	2433	2679	2691
emaro	36	8	D	14	26	27	2780	2780	3038	3039
ezia	36	10	A	15	27	27	1810	1835	1996	2021
eolum	36	10	B	15	27	27	2128	2147	2345	2364
emie	36	10	C	15	27	27	2534	2546	2822	2834
etten	36	10	D	15	27	27	2903	2902	3188	3188
elazo	36	12	A	16	28	27	1884	1909	2084	2109
estro	36	12	B	16	28	27	2219	2238	2458	2477
esta	36	12	C	16	28	27	2644	2656	2962	2973
erata	36	12	D	16	28	27	3032	3033	3349	3350
erolla	36	14	A	18	30	29	2039	2065	2279	2304
eriate	36	14	B	18	30	29	2415	2433	2709	2728
eraria	36	14	C	18	30	29	2872	2883	3251	3263
escos	36	14	D	18	30	29	3470	3470	4033	4033
ebas	36	16	A	19	31	29	2135	2160	2410	2436
ently	36	16	B	19	31	29	2521	2540	2853	2872
fod	36	16	C	19	31	29	3003	3014	3431	3442
firn	36	16	D	19	31	29	3618	3617	4231	4230
form	36	18	A	20	34	29	2279	2246	2581	2548
falcon	36	18	B	20	34	29	2701	2650	3073	3022
faut	36	18	C	20	34	29	3206	3136	3673	3604
gabas	36	18	D	20	34	29	3852	3755	4506	4409
gamos	36	20	A	21	36	29	2409	2346	2752	2689
gareo	36	20	B	21	36	29	2885	2800	3336	3251
gesa	36	20	C	21	36	29	3537	3426	4212	4101
infer	36	20	D	21	36	29	4050	3905	4757	4612
igab	36	24	A	23	38	29	2451	2513	2844	2907
igadu	36	24	B	23	38	29	3099	3014	2624	3539
igam	36	24	C	23	38	29	3806	3695	4585	4474

Large diameter tees and crosses with ribs, or with ribs and bolted through flats when required. See page 51. L—1105
All weights are approximate.

Standard Special Castings for Water

Table No. 14—Continued. Standard Branches

Code Terminal	Nominal Diameter Inches A	Nominal Diameter Inches B	Class	Dimensions, Inches H	Dimensions, Inches J	Dimensions, Inches I	Approximate Weights, Pounds — Code Stems Alip (3-Way Branches, 2 Bells)	Alos (3-Way Branches, 3 Bells)	Alut (4-Way Branches, 3 Bells)	Aman (4-Way Branches, 4 Bells)
igand	36	24	D	23	38	29	4511	4366	5307	5161
igar	36	30	A	26	43	29	2830	2708	3242	3120
icell	36	30	B	26	43	29	3594	3438	4335	4179
icet	36	30	C	26	43	29	4248	4055	5140	4947
illus	36	30	D	26	43	29	5160	4918	6192	5950
iculo	36	36	A	29	46	29	3067	2946	3539	3418
iaba	36	36	B	29	46	29	4046	3891	4956	4800
illa	36	36	C	29	46	29	4788	4595	5867	5673
itude	36	36	D	29	46	29	5810	5567	7099	6857
irem	42	12	A	16	28	30	2507	2577	3467	3537
icar	42	12	B	16	28	30	2670	2889	3131	3170
ieben	42	12	C	16	28	30	3478	3507	3830	3860
itio	42	12	D	16	28	30	3971	3989	4307	4325
idous	42	14	A	18	30	32	2671	2739	2942	3010
igra	42	14	B	18	30	32	3075	3114	3400	3440
ilan	42	14	C	18	30	32	3747	3776	4147	4177
iferos	42	14	D	18	30	32	4590	4609	5288	5306
ibus	42	16	A	19	31	32	2778	2846	3080	3148
icant	42	16	B	19	31	32	3196	3235	3552	3592
idity	42	16	C	19	31	32	3891	3920	4325	4354
itivo	42	16	D	19	31	32	4754	4772	5487	5506
ista	42	18	A	20	34	32	2950	2941	3268	3258
idum	42	18	B	20	34	32	3407	3357	3794	3744
itant	42	18	C	20	34	32	4393	4312	5108	5028
ilage	42	18	D	20	34	32	5049	4939	5819	5709
icolea	42	20	A	21	36	32	3104	3056	3459	3411
iches	42	20	B	21	36	32	3582	3486	4009	3913
kem	42	20	C	21	36	32	4615	4479	5387	5251
kunger	42	20	D	21	36	32	5297	5123	6122	5948
linos	42	24	A	23	38	32	3314	3266	3724	3676
linu	42	24	B	23	38	32	3852	3756	4370	4274
lock	42	24	C	23	38	32	4965	4829	5866	5730
lack	42	24	D	23	38	32	5709	5535	6579	6405
lard	42	30	A	26	43	32	3679	3553	4144	4018
lake	41	30	B	26	43	32	4554	4370	5416	5230
lamie	42	30	C	26	43	32	5649	5402	6675	6428
lante	43	30	D	26	43	32	6561	6258	7729	7426
lapel	42	36	A	29	46	32	4076	3950	4705	4579
laret	42	36	B	29	46	32	4903	4718	5845	5659
laron	42	36	C	29	46	32	6150	5904	7261	7015
latesi	42	36	D	29	46	32	7187	6884	8512	8209
leaba	42	42	A	32	49	32	4393	4267	5109	4983
leam	42	42	B	32	49	32	5533	5348	6641	6455
lieu	42	42	C	32	49	32	7001	6755	8392	8146
leat	42	42	D	32	49	32	8158	7855	9803	9500

Large diameter tees and crosses with ribs, or with ribs and bolted through flats when required. See page 51. L—1105
All weights are approximate.

Standard Special Castings for Water

Table No. 14—Continued. Standard Branches

Code Terminal	Nominal Diameter Inches A	Nominal Diameter Inches B	Class	Dimensions, Inches H	Dimensions, Inches J	Dimensions, Inches I	Approximate Weights, Pounds — Code Stems: Allp (3-Way Branches, 2 Bells)	Allp (3-Way Branches, 3 Bells)	Alut (4-Way Branches, 3 Bells)	Aman (4-Way Branches, 4 Bells)
libe	48	12	A	17	29	33	3266	3319	3653	3707
leau	48	12	B	17	29	33	3752	3804	4107	4160
low	48	12	C	17	29	33	4510	4576	4940	5007
loto	48	12	D	17	29	33	5564	5624	6376	6436
lear	48	14	A	18	30	35	3422	3476	3762	3815
lest	48	14	B	18	30	35	4173	4226	4836	4889
lita	48	14	C	18	30	35	4965	5030	5712	5778
lobe	48	14	D	18	30	35	5754	5815	6596	6656
nary	48	16	A	19	31	35	3565	3619	3947	4001
nois	48	16	B	19	31	35	4046	4098	4466	4519
nuse	48	16	C	19	31	35	5055	5121	5755	5821
nade	48	16	D	19	31	35	5967	6028	6860	6921
nion	48	18	A	20	34	35	3775	3729	4166	4120
nelz	48	18	B	20	34	35	4287	4225	4718	4655
nera	48	18	C	20	34	35	5479	5407	6328	6256
onbius	48	18	D	20	34	35	6328	6227	7259	7158
ostet	48	20	A	21	36	35	3956	3860	4378	4282
ovia	48	20	B	21	36	35	4500	4380	4973	4853
opiro	48	20	C	21	36	35	5745	5604	6652	6511
oten	48	20	D	21	36	35	6607	6425	7574	7392
orgen	48	24	A	23	38	35	4221	4125	4706	4609
oque	48	24	B	23	38	35	5028	4908	5798	5678
olare	48	24	C	23	38	35	6193	6052	7272	7131
onnie	48	24	D	23	38	35	7064	6882	7994	7812
orios	48	30	A	26	43	35	4748	4553	5361	5166
ollos	48	30	B	26	43	35	5685	5451	6653	6418
orium	48	30	C	26	43	35	7042	6762	8265	7985
occla	48	30	D	26	43	35	8051	7708	9303	8960
oltoe	48	36	A	29	46	35	5150	4953	5859	5662
ocol	48	36	B	29	46	35	6322	6088	7382	7148
onet	48	36	C	29	46	35	7603	7323	8915	8635
obes	48	36	D	29	46	35	8830	8487	10336	9993
ocet	48	42	A	32	49	35	5503	5307	6266	6069
omen	48	42	B	32	49	35	6821	6587	7973	7739
ofer	48	42	C	32	49	35	8278	7999	9750	9470
odis	48	42	D	32	49	35	9644	9301	11367	11024
tigab	48	48	A	35	52	35	6043	5846	7043	6846
toris	48	48	B	35	52	35	7659	7424	9076	8841
tras	48	48	C	35	52	35	9229	8950	11006	10726
trud	48	48	D*	35	52	35				

Large diameter tees and crosses with ribs, or with ribs and bolted through flats, or made in steel. See page 51. L—1105

* Made in steel.

All weights are approximate.

Standard Special Castings for Water

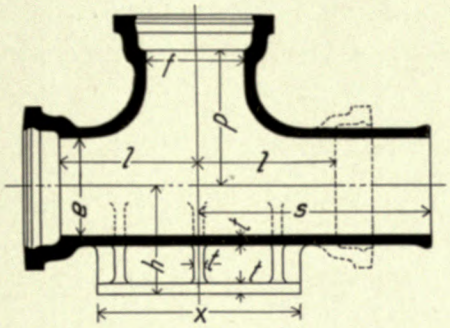


TABLE NO. 15. Standard Base Tees

Code Terminal	Nom'l Diam. Inches		Class	l	s	p	h	Approx. Weight Pounds		Code Terminal	Nom'l Diam. Inches		Class	l	s	p	h	Approx. Weight Pounds	
								2 Bells	3 Bells									2 Bells	3 Bells
	e	f						Code **Amep**	Code **Amis**		e	f						Code **Amep**	Code **Amis**
arent	3	3	D	10	22	10	4.50	104	106	**acibus**	16	6	D	17	29	17	13.00	1021	998
aca	4	3	D	11	23	11	5.50	139	138	**alite**	16	8	B	17	29	17	13.00	864	859
ame	4	4	D	11	23	11	5.50	143	146	**atima**	16	8	D	17	29	17	13.00	1050	1027
alizo	6	3	D	12	24	12	6.50	205	202	**andos**	16	10	B	17	29	17	13.00	879	874
aras	6	4	D	12	24	12	6.50	217	215	**barla**	16	10	D	17	29	17	13.00	1091	1068
atore	6	6	D	12	24	12	6.50	235	232	**barot**	16	12	B	17	29	17	13.00	904	899
anha	8	4	D	13	25	13	7.50	318	311	**basan**	16	12	D	17	29	17	13.00	1103	1080
atico	8	6	D	13	25	13	7.50	334	326	**basse**	16	14	B	17	29	17	13.00	914	909
avel	8	8	D	13	25	13	7.50	357	350	**bara**	16	14	D	17	29	17	13.00	1122	1099
afft	10	4	D	14	26	14	9.00	435	417	**beran**	16	16	B	17	29	17	13.00	948	946
anion	10	6	D	14	26	14	9.00	450	431	**bevel**	16	16	D	17	29	17	13.00	1123	1120
anis	10	8	D	14	26	14	9.00	468	450	**bero**	18	4	B	18	30	18	14.00	1035	1030
arca	10	10	D	14	26	14	9.00	493	474	**bias**	18	4	D	18	30	18	14.00	1233	1207
aclie	12	4	D	15	27	15	10.00	596	568	**biam**	18	6	B	18	30	18	14.00	1045	1040
amus	12	6	D	15	27	15	10.00	609	581	**biolan**	18	6	D	18	30	18	14.00	1248	1222
atum	12	8	D	15	27	15	10.00	625	597	**biate**	18	8	B	18	30	18	14.00	1060	1055
acho	12	10	D	15	27	15	10.00	642	614	**bione**	18	8	D	18	30	18	14.00	1280	1254
aril	12	12	D	15	27	15	10.00	663	635	**bonca**	18	10	B	18	30	18	14.00	1075	1070
abunt	14	4	B	16	28	16	12.00	661	656	**bolla**	18	10	D	18	30	18	14.00	1318	1292
anclum	14	4	D	16	28	16	12.00	790	764	**brona**	18	12	B	18	30	18	14.00	1095	1090
atur	14	6	B	16	28	16	12.00	676	671	**begi**	18	12	D	18	30	18	14.00	1355	1329
avero	14	6	D	16	28	16	12.00	810	784	**belag**	18	14	B	18	30	18	14.00	1105	1100
arizo	14	8	B	16	28	16	12.00	691	686	**belas**	18	14	D	18	30	18	14.00	1363	1337
averi	14	8	D	16	28	16	12.00	838	812	**belge**	18	16	B	18	30	18	14.00	1135	1130
arate	14	10	B	16	28	16	12.00	711	701	**balk**	18	16	D	18	30	18	14.00	1388	1362
atorem	14	10	D	16	28	16	12.00	855	829	**bell**	18	18	B	18	30	18	14.00	1175	1169
anos	14	12	B	16	28	16	12.00	736	726	**belon**	18	18	D	18	30	18	14.00	1450	1424
abor	14	12	D	16	28	16	12.00	874	848	**belrod**	20	4	B	19	31	19	15.00	1275	1268
abaris	14	14	B	16	28	16	12.00	751	745	**benk**	20	4	D	19	31	19	15.00	1524	1500
acity	14	14	D	16	28	16	12.00	926	900	**beure**	20	6	B	19	31	19	15.00	1282	1272
arage	16	4	B	17	29	17	13.00	834	829	**berd**	20	6	D	19	31	19	15.00	1540	1516
agno	16	4	D	17	29	17	13.00	894	889	**biene**	20	8	B	19	31	19	15.00	1297	1287
avate	16	6	B	17	29	17	13.00	849	844	**bill**	20	8	D	19	31	19	15.00	1564	1540

All weights are approximate.

L-5229

Standard Special Castings for Water

TABLE No. 15—Continued. Standard Base Tees

Code Terminal	Nom'l Diam. Inches		Class	l	s	p	h	Approx. Weight Pounds	
								2 Bells	3 Bells
	e	f						Code **Amep**	Code **Amis**
binal	20	10	B	19	31	19	15.00	1307	1297
binl	20	10	D	19	31	19	15.00	1604	1579
bio	20	12	B	19	31	19	15.00	1327	1317
biros	20	12	D	19	31	19	15.00	1640	1615
brito	20	14	B	19	31	19	15.00	1332	1322
brom	20	14	D	19	31	19	15.00	1694	1670
buron	20	16	B	19	31	19	15.00	1362	1352
borol	20	16	D	19	31	19	15.00	1699	1675
bucu	20	18	B	19	31	19	15.00	1387	1377
bonne	20	18	D	19	31	19	15.00	1717	1693
bril	20	20	B	19	31	19	15.00	1429	1422
bunt	20	20	D	19	31	19	15.00	1814	1790
back	24	6	B	21	33	21	17.50	1783	1763
biolus	24	6	D	21	33	21	17.50	2144	2111
buls	24	8	B	21	33	21	17.50	1797	1777
berto	24	8	D	21	33	21	17.50	2171	2138
borne	24	10	B	21	33	21	17.50	1815	1795
card	24	10	D	21	33	21	17.50	2206	2173
cana	24	12	B	21	33	21	17.50	1836	1816
carlo	24	12	D	21	33	21	17.50	2242	2209
cape	24	14	B	21	33	21	17.50	1876	1855
cift	24	14	D	21	33	21	17.50	2284	2251
cire	24	16	B	21	33	21	17.50	1917	1897
dea	24	16	D	21	33	21	17.50	2332	2299
del	24	18	B	21	33	21	17.50	1934	1914
deral	24	18	D	21	33	21	17.50	2359	2326
deros	24	20	B	21	33	21	17.50	1948	1928
della	24	20	D	21	33	21	17.50	2499	2465
dicort	24	24	B	21	33	21	17.50	1997	1977
digli	24	24	D	21	33	21	17.50	2620	2587
donia	30	6	A	13	25	24	21.00	2224	2252
dongo	30	6	B	13	25	24	21.00	2385	2369
dorum	30	6	C	13	25	24	21.00	2645	2625
dabam	30	6	D	13	25	24	21.00	2886	2872
dage	30	8	A	14	26	24	21.00	2270	2298
dame	30	8	B	14	26	24	21.00	2434	2418
daria	30	8	C	14	26	24	21.00	2717	2697
dast	30	8	D	14	26	24	21.00	2956	2942
dean	30	10	A	15	27	24	21.00	2321	2348
delag	30	10	B	15	27	24	21.00	2490	2473
dilas	30	10	C	15	27	24	21.00	2809	2789
dulf	30	10	D	15	27	24	21.00	3060	3046
deur	30	12	A	15	27	24	21.00	2347	2372
dra	30	12	B	15	27	24	21.00	2507	2492
dalt	30	12	C	15	27	24	21.00	2863	2843
dade	30	12	D	15	27	24	21.00	3106	3092
dangis	30	14	A	18	30	26	21.00	2499	2527
darb	30	14	B	18	30	26	21.00	2757	2741
dobs	30	14	C	18	30	26	21.00	3111	3092
dofen	30	14	D	18	30	26	21.00	3519	3505
dort	30	16	A	19	31	26	21.00	2600	2627
dolt	30	16	B	19	31	26	21.00	2851	2835
dean	30	16	C	19	31	26	21.00	3224	3205
dique	30	16	D	19	31	26	21.00	3644	3630
dering	30	18	A	20	34	26	21.00	2709	2693
dellos	30	18	B	20	34	26	21.00	2996	2928
ebam	30	18	C	20	34	26	21.00	3386	3305
entib	30	18	D	20	34	26	21.00	3757	3743
entis	30	20	A	21	36	26	21.00	2809	2770
eola	30	20	B	21	36	26	21.00	3134	3040
erem	30	20	C	21	36	26	21.00	3619	3507
etori	30	20	D	21	36	26	21.00	3993	3873
etra	30	24	A	23	38	26	21.00	2931	2892
etros	30	24	B	23	38	26	21.00	3265	3171
enbin	30	24	C	23	38	26	21.00	3799	3688
engo	30	24	D	23	38	26	21.00	4242	4122
engra	30	30	A	26	43	26	21.00	3164	3081
erin	30	30	B	26	43	26	21.00	3551	3405
ernol	30	30	C	26	43	26	21.00	4262	4089
ernu	30	30	D	26	43	26	21.00	4802	4612
erfen	36	8	A	14	26	27	24.50	3236	3262
erish	36	8	B	14	26	27	24.50	3540	3558
eone	36	8	C	14	26	27	24.50	3906	3918
emaro	36	8	D	14	26	27	24.50	4265	4265
ezia	36	10	A	15	27	27	24.50	3295	3320
eolum	36	10	B	15	27	27	24.50	3613	3632
emie	36	10	C	15	27	27	24.50	4019	4031
etten	36	10	D	15	27	27	24.50	4388	4387
elazo	36	12	A	16	28	27	24.50	3369	3394
estro	36	12	B	16	28	27	24.50	3704	3723
esta	36	12	C	16	28	27	24.50	4129	4141
erata	36	12	D	16	28	27	24.50	4517	4518
erolla	36	14	A	18	30	29	24.50	3524	3550
erlate	36	14	B	18	30	29	24.50	3900	3918
erala	36	14	C	18	30	29	24.50	4357	4368
escos	36	14	D	18	30	29	24.50	4955	4955
ebas	36	16	A	19	31	29	24.50	3620	3645
ently	36	16	B	19	31	29	24.50	4006	4025
fod	36	16	C	19	31	29	24.50	4488	4499
firm	36	16	D	19	31	29	24.50	5103	5102
form	36	18	A	20	34	29	24.50	3764	3731
falcon	36	18	B	20	34	29	24.50	4186	4135

Large diameter tees ribbed (and bolted). See page 51.
All weights are approximate.

L—5229

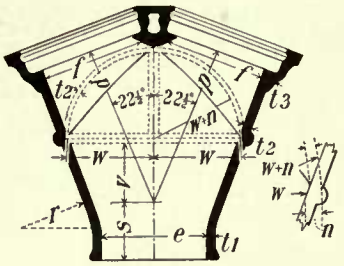
Standard Special Castings for Water

Table No. 15—Continued. Standard Base Tees

Code Terminal	Nom'l Diam. Inches e	f	Class	l	s	p	h	Approx. Weight Pounds 2 Bells Code Amep	3 Bells Code Amis
faut	36	18	C	20	34	29	24.50	4691	4621
gabas	36	18	D	20	34	29	24.50	5337	5240
gamos	36	20	A	21	36	29	24.50	3894	3831
gareo	36	20	B	21	36	29	24.50	4370	4285
gesa	36	20	C	21	36	29	24.50	5022	4911
infer	36	20	D	21	36	29	24.50	5535	5390
igab	36	24	A	23	38	29	24.50	3936	3998
igadu	36	24	B	23	38	29	24.50	4584	4499
igam	36	24	C	23	38	29	24.50	5291	5180
igand	36	24	D	23	38	29	24.50	5996	5851
igar	36	30	A	26	43	29	24.50	4315	4193
icell	36	30	B	26	43	29	24.50	5079	4923
icet	36	30	C	26	43	29	24.50	5733	5540
illus	36	30	D	26	43	29	24.50	6645	6403
iculo	36	36	A	29	46	29	24.50	4552	4431
iaba	36	36	B	29	46	29	24.50	5531	5376
illa	36	36	C	29	46	29	24.50	6273	6080
itude	36	36	D	29	46	29	24.50	7295	7052
irem	42	12	A	16	28	30	28.00	4710	4780
icar	42	12	B	16	28	30	28.00	4873	5092
ieben	42	12	C	16	28	30	28.00	5681	5710
itlo	42	12	D	16	28	30	28.00	6174	6192
idous	42	14	A	18	30	32	28.00	4874	4942
igra	42	14	B	18	30	32	28.00	5278	5317
ilan	42	14	C	18	30	32	28.00	5950	5979
iferos	42	14	D	18	30	32	28.00	6793	6812
ibus	42	16	A	19	31	32	28.00	4981	5049
icant	42	16	B	19	31	32	28.00	5399	5438
idlty	42	16	C	19	31	32	28.00	6094	6123
itivo	42	16	D	19	31	32	28.00	6957	6975
ista	42	18	A	20	34	32	28.00	5153	5144
idum	42	18	B	20	34	32	28.00	5610	5560
itant	42	18	C	20	34	32	28.00	6596	6515
llage	42	18	D	20	34	32	28.00	7252	7142
icolea	42	20	A	21	36	32	28.00	5307	5259
iches	42	20	B	21	36	32	28.00	5785	5689
kem	42	20	C	21	36	32	28.00	6818	6682
kunger	42	20	D	21	36	32	28.00	7500	7326
llnos	42	24	A	23	38	32	28.00	5517	5469
llnu	42	24	B	23	38	32	28.00	6055	5959
lock	42	24	C	23	38	32	28.00	7168	7032
lack	42	24	D	23	38	32	28.00	7912	7738
lard	42	30	A	26	43	32	28.00	5882	5756
lake	42	30	B	26	43	32	28.00	6757	6573
lamie	42	30	C	26	43	32	28.00	7852	7605
lante	42	30	D	26	43	32	28.00	8764	8461
lapel	42	36	A	29	46	32	28.00	6279	6153
laret	42	36	B	29	46	32	28.00	7106	6921
laron	42	36	C	29	46	32	28.00	8353	8107
latesi	42	36	D	29	46	32	28.00	9390	9087
leaba	42	42	A	32	49	32	28.00	6596	6470
leam	42	42	B	32	49	32	28.00	7736	7551
lieu	42	42	C	32	49	32	28.00	9204	8958
leat	42	42	D	32	49	32	28.00	10361	10058
libe	48	12	A	17	29	33	31.50	6361	6414
leau	48	12	B	17	29	33	31.50	6847	6899
low	48	12	C	17	29	33	31.50	7605	7671
loto	48	12	D	17	29	33	31.50	8659	8719
lear	48	14	A	18	30	35	31.50	6517	6571
lest	48	14	B	18	30	35	31.50	7268	7321
lita	48	14	C	18	30	35	31.50	8060	8125
lobe	48	14	D	18	30	35	31.50	8849	8910
nary	48	16	A	19	31	35	31.50	6660	6714
nois	48	16	B	19	31	35	31.50	7141	7193
nuse	48	16	C	19	31	35	31.50	8150	8216
nade	48	16	D	19	31	35	31.50	9062	9123
nlon	48	18	A	20	34	35	31.50	6870	6824
nelz	48	18	B	20	34	35	31.50	7382	7320
nera	48	18	C	20	34	35	31.50	8574	8502
onblus	48	18	D	20	34	35	31.50	9423	9322
oster	48	20	A	21	36	35	31.50	7051	6955
ovia	48	20	B	21	36	35	31.50	7595	7475
opiro	48	20	C	21	36	35	31.50	8840	8699
oten	48	20	D	21	36	35	31.50	9702	9520
orgen	48	24	A	23	38	35	31.50	7316	7220
oque	48	24	B	23	38	35	31.50	8123	8003
olare	48	24	C	23	38	35	31.50	9288	9147
onnle	48	24	D	23	38	35	31.50	10159	9977
orlos	48	30	A	26	43	35	31.50	7843	7648
ollos	48	30	B	26	43	35	31.50	8780	8546
orium	48	30	C	26	43	35	31.50	10137	9857
occia	48	30	D	26	43	35	31.50	11146	10803
oltoe	48	36	A	29	46	35	31.50	8245	8048
ocol	48	36	B	29	46	35	31.50	9417	9183
onet	48	36	C	29	46	35	31.50	10698	10418
obes	48	36	D	29	46	35	31.50	11925	11582
ocet	48	42	A	32	49	35	31.50	8598	8402
omen	48	42	B	32	49	35	31.50	9916	9682
ofer	48	42	C	32	49	35	31.50	11373	11094
odis	48	42	D	32	49	35	31.50	12739	12396
tigab	48	48	A	35	52	35	31.50	9138	8941
toris	48	48	B	35	52	35	31.50	10754	10519
tras	48	48	C	35	52	35	31.50	12324	12045
trud	48	48	D*	35	52	35	31.50		

Large diameter tees ribbed (and bolted). See page 51.
All weights are approximate.
*Made in steel.

L—5729



Standard Special Castings for Water

Standard Y Branches, Type 1

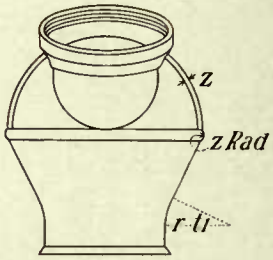


TABLE No. 16. Code Word, **Amot**

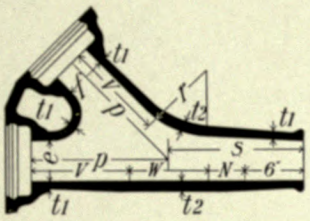
Code Terminal	Nominal Diam., Inches e	Nominal Diam., Inches f	Class	s	p	v	w	n	r	Thickness, Inches t_1	Thickness, Inches t_2	Thickness, Inches t_3	Approx. Weight Pounds
arll	12	12	D	16.0	21.50	8.00	9.79	1.17	30	.75	1.08	.75	687
abaris	14	14	B	16.0	24.00	9.0	11.30	1.08	30	.66	.99	.66	738
acity	14	14	D	16.0	24.00	9.0	11.30	1.32	30	.82	1.22	.82	894
beren	16	16	B	17.0	27.50	10.50	13.00	1.12	30	.70	1.03	.70	942
bevel	16	16	D	17.0	27.50	10.50	13.00	1.39	30	.89	1.29	.89	1275
bell	18	18	B	18.0	30.00	12.0	14.70	1.17	30	.75	1.08	.75	1266
belon	18	18	D	18.0	30.00	12.0	14.70	1.46	30	.96	1.36	.96	1607
brll	20	20	B	18.0	34.00	13.50	16.40	1.26	30	.80	1.16	.80	1635
bunt	20	20	D	18.0	34.00	13.50	16.40	1.57	30	1.03	1.46	1.03	2296
deros	24	20	B	12.00	34.00	13.50	16.40	1.26	30	.89	1.16	.80	1663
della	24	20	D	12.00	34.00	13.50	16.40	1.57	30	1.16	1.46	1.03	2393
decort	24	24	B	18.00	38.00	15.25	19.30	1.36	30	.89	1.26	.89	2300
digli	24	24	D	18.00	38.00	15.25	19.30	1.75	30	1.16	1.63	1.16	2957
etra	30	24	A	12.00	38.00	15.25	19.30	1.36	30	.88	1.26	.89	2171
etros	30	24	B	12.00	38.00	15.25	19.30	1.36	30	1.03	1.26	.89	2217
enbln	30	24	C	12.00	38.00	15.25	19.30	1.75	30	1.20	1.63	1.16	2717
engs	30	24	D	12.00	38.00	15.25	19.30	1.75	30	1.37	1.63	1.16	2811
engra	30	30	A	18.00	48.00	18.00	23.70	1.32	30	.88	1.22	.88	3153
erin	30	30	B	18.00	48.00	18.00	23.70	1.59	30	1.03	1.47	1.03	3687
ernol	30	30	C	18.00	48.00	18.00	23.70	1.88	30	1.20	1.74	1.20	4285
ernu	30	30	D	18.00	48.00	18.00	23.70	2.17	30	1.37	2.01	1.37	4941
igar	36	30	A	10.00	48.00	18.00	23.70	1.32	30	.99	1.22	.88	3343
icell	36	30	B	10.00	48.00	18.00	23.70	1.59	30	1.15	1.47	1.03	3874
icet	36	30	C	10.00	48.00	18.00	23.70	1.88	30	1.36	1.74	1.20	4486
lilus	36	30	D	10.00	48.00	18.00	23.70	2.17	30	1.58	2.01	1.37	5189
iculo	36	36	A	18.00	56.00	21.00	28.20	1.50	24	.99	1.39	.99	4949
iaba	36	36	B	18.00	56.00	21.00	28.20	1.79	24	1.15	1.66	1.15	5858
illa	36	36	C	18.00	56.00	21.00	28.20	2.13	24	1.36	1.98	1.36	6804
itude	36	36	D	18.00	56.00	21.00	28.20	2.48	24	1.58	2.31	1.58	8082
lard	42	30	A	6.00	48.00	18.00	23.70	1.32	30	1.10	1.22	.88	3368
lake	42	30	B	6.00	48.00	18.00	23.70	1.59	30	1.28	1.47	1.03	3890
lamie	42	30	C	6.00	48.00	18.00	23.70	1.88	30	1.54	1.74	1.20	4543
iante	42	30	D	6.00	48.00	18.00	23.70	2.17	30	1.78	2.01	1.37	5241
lapel	42	36	A	10.00	56.00	21.00	28.20	1.50	24	1.10	1.39	.99	4904
laret	42	36	B	10.00	56.00	21.00	28.20	1.79	24	1.28	1.66	1.15	5789
laron	42	36	C	10.00	56.00	21.00	28.20	2.13	24	1.54	1.98	1.36	6761
latesi	42	36	D	10.00	56.00	21.00	28.20	2.48	24	1.78	2.31	1.58	8025
leaba	42	42	A	18.00	66.00	25.00	33.10	1.72	24	1.10	1.60	1.10	7394
leam	42	42	B	18.00	66.00	25.00	33.10	2.05	24	1.28	1.90	1.28	8417
llen	42	42	C	18.00	66.00	25.00	33.10	2.46	24	1.54	2.28	1.54	10377
leat	42	42	D	18.00	66.00	25.00	33.10	2.85	24	1.78	2.64	1.78	12072
oltoe	48	36	A	2.00	56.00	21.00	28.20	1.50	24	1.26	1.39	.99	4727
ocol	48	36	B	2.00	56.00	21.00	28.20	1.79	24	1.42	1.66	1.15	5584
onet	48	36	C	2.00	56.00	21.00	28.20	2.13	24	1.71	1.98	1.36	6494
obes	48	36	D	2.00	56.00	21.00	28.20	2.48	24	1.96	2.31	1.58	7731
ocet	48	42	A	10.00	66.00	25.00	33.10	1.72	24	1.26	1.60	1.10	7345
omen	48	42	B	10.00	66.00	25.00	33.10	2.05	24	1.42	1.90	1.28	8338
ofer	48	42	C	10.00	66.00	25.00	33.10	2.46	24	1.71	2.28	1.54	10249
odis	48	42	D	10.00	66.00	25.00	33.10	2.85	24	1.96	2.64	1.78	11924
tlgat	48	48	A	18.00	76.00	28.00	37.60	1.99	24	1.26	1.86	1.26	10200
toris	48	48*	B	18.00	76.00	28.00	37.60	2.32	24	1.42	2.15	1.42	12132
tras	48	48	C	18.00	76.00	28.00	37.60	2.78	24	1.71	2.57	1.71	14716
trud	48	48	D	18.00	76.00	28.00	37.60	3.20	24	1.96	2.95	1.96	16965

L—5292

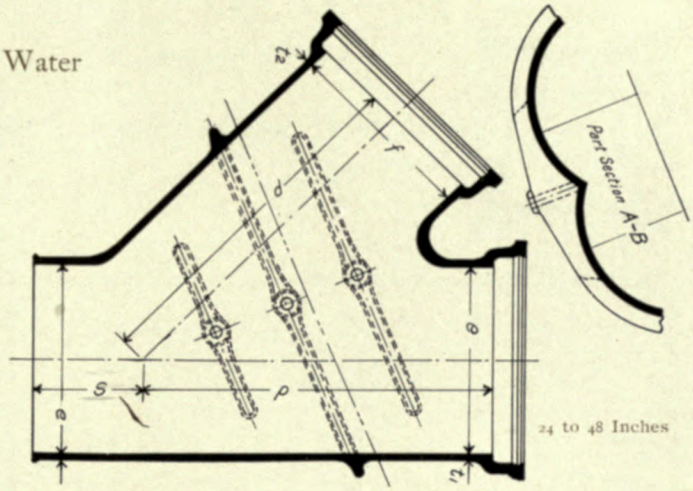
All weights are approximate.

Standard Special Castings for Water

Y Branches, Type 2



4 to 20 Inches



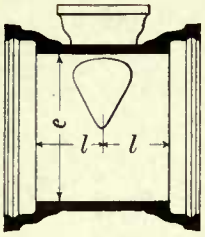
24 to 48 Inches

Table No. 17. Code Word, **Amuv**

Code Terminal	Nominal Diam., Inches		Class	s	p	v	w	n	r	Thickness Inches		Approx. Weight Pounds
	e	f								t_1	t_2	
ame	4	4	D	11.50	10.50	7.18	6.64	2.18	6	.52	.64	103
atore	6	6	D	13.00	13.00	9.27	7.46	3.27	6	.55	.67	181
avel	8	8	D	14.00	16.00	11.85	8.30	3.85	6	.60	.72	291
arca	10	10	D	15.50	18.50	13.94	9.12	4.94	6	.68	.83	434
aril	12	12	D	15.50	21.50	16.54	9.92	4.54	6	.75	.93	632
abaris	14	14	B	16.00	24.00	18.62	10.76	4.62	6	.66	.84	690
acity	14	14	D	16.00	24.00	18.62	10.76	4.62	6	.82	1.00	985
beran	16	16	B	17.50	31.00	25.20	11.60	5.70	6	.70	1.03	967
bevel	16	16	D	17.50	31.00	25.20	11.60	5.70	6	.89	1.29	1413
bell	18	18	B	18.00	34.00	28.00	12.00	6.00	6	.75	1.12	1358
belon	18	18	D	18.00	34.00	28.00	12.00	6.00	6	.96	1.44	1737
bril	20	20	B	18.75	37.00	30.75	12.50	6.50	6	.80	1.20	1725
bunt	20	20	D	18.75	37.00	30.75	12.50	6.50	6	1.03	1.50	2199
deros	24	20	B	18.75	40.00	.....	.....	....	6	.89	.80	2203
della	24	20	D	18.75	40.00	.....	.....	....	6	1.16	1.03	3087
dicort	24	24	B	19.75	42.00	.....	.....	....	6	.89	.89	2600
digli	24	24	D	19.75	42.00	.....	.....	....	6	1.16	1.16	3590
etra	30	24	A	17.00	49.50	.....	.....	....	6	.88	.89	3178
etros	30	24	B	17.00	49.50	.....	.....	....	6	1.03	.89	3874
engra	30	30	A	22.75	52.50	.....	.....	....	6	.88	.88	3519
erin	30	30	B	22.75	52.50	.....	.....	....	6	1.03	1.03	4360
igar	36	30	A	19.75	56.00	.....	.....	....	6	.99	.88	4338
icell	36	30	B	19.75	56.00	.....	.....	....	6	1.15	1.03	4425
iculo	36	36	A	24.00	60.00	.....	.....	....	6	.99	.99	4951
iaba	36	36	B	24.00	60.00	.....	.....	....	6	1.15	1.15	6509
lard	42	30	A	16.75	63.00	.....	.....	....	6	1.10	.88	5543
lake	42	30	B	16.75	63.00	.....	.....	....	6	1.28	1.03	6782
lapel	42	36	A	21.00	66.00	.....	.....	....	6	1.10	.99	6446
laret	42	36	B	21.00	66.00	.....	.....	....	6	1.28	1.15	7895
leaba	42	42	A	25.25	69.00	.....	.....	....	6	1.10	1.10	7591
leam	42	42	B	25.25	69.00	.....	.....	....	6	1.28	1.28	9163
oltoe	48	36	A	18.00	71.00	.....	.....	....	6	1.26	.99	7850
ocol	48	36	B	18.00	71.00	.....	.....	....	6	1.42	1.15	9500
ocet	48	42	A	22.25	74.00	.....	.....	....	6	1.26	1.10	9116
omen	48	42	B	22.25	74.00	.....	.....	....	6	1.42	1.28	10887
tigab	48	48	A	26.50	77.00	.....	.....	....	6	1.26	1.26	10599
toris	48	48	B	26.50	77.00	.....	.....	....	6	1.42	1.42	12554

L—5293

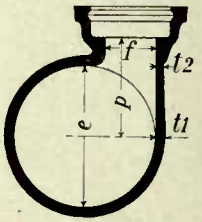
Y Branches, Type 2, for heavier pressure. Classes C and D to special design, but with same laying dimensions.
All weights are approximate.



Standard Special Castings for Water

Standard Blow-off Branches

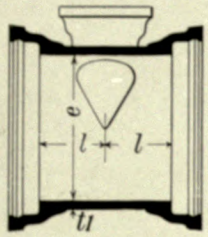
TABLE No. 18. Code Stem, **Anap**



Code Terminal	Nominal Diameter Inches e	Nominal Diameter Inches f	Class	l	p	Thickness Inches t_1	Thickness Inches t_2	Approx. Weight Pounds
anha	8	4	D	12	7	.60	.52	227
afft	10	4	D	12	8	.68	.52	286
anion	10	6	D	12	8	.68	.55	300
aclie	12	4	D	12	10	.75	.52	365
amus	12	6	D	12	10	.75	.55	379
abunt	14	4	B	12	11	.66	.52	400
andum	14	4	D	12	11	.82	.52	471
atur	14	6	B	12	11	.66	.55	415
avero	14	6	D	12	11	.82	.55	486
arage	16	4	B	12	12	.70	.52	497
agero	16	4	D	12	12	.89	.52	597
avate	16	6	B	12	12	.70	.55	513
acibus	16	6	D	12	12	.89	.55	613
bero	18	4	B	12	13	.75	.52	586
bias	18	4	D	12	13	.96	.52	704
biam	18	6	B	12	13	.75	.55	603
biolan	18	6	D	12	13	.96	.55	720
belrod	20	4	B	12	14	.80	.52	687
benk	20	4	D	12	14	1.03	.52	850
beure	20	6	B	12	14	.80	.55	705
berd	20	6	D	12	14	1.03	.55	867
back	24	6	B	12	16	.89	.55	916
biolus	24	6	D	12	16	1.16	.55	1149
bais	24	8	B	12	16	.89	.60	935
berto	24	8	D	12	16	1.16	.60	1170
dage	30	8	A	13	20	.88	.60	1269
dame	30	8	B	13	20	1.03	.60	1382
daria	30	8	C	13	20	1.20	.60	1616
dast	30	8	D	13	20	1.37	.60	1867
deur	30	12	A	13	20	.88	.75	1315
dra	30	12	B	13	20	1.03	.75	1426
dalt	30	12	C	13	20	1.20	.75	1658
dade	30	12	D	13	20	1.37	.75	1913
erfen	36	8	A	13	23	.99	.60	1653
erish	36	8	B	13	23	1.15	.60	1922
eone	36	8	C	13	23	1.36	.60	2234
emaro	36	8	D	13	23	1.58	.60	2576
elazo	36	12	A	13	23	.99	.75	1702
estro	36	12	B	13	23	1.15	.75	1972
esta	36	12	C	13	23	1.36	.75	2285
erate	36	12	D	13	23	1.58	.75	2627
irem	42	12	A	15	26	1.10	.75	2432
icar	42	12	B	15	26	1.28	.75	2728
ieben	42	12	C	15	26	1.54	.75	3271
itio	42	12	D	15	26	1.78	.75	3768
ibus	42	16	A	15	26	1.10	.70	2489
icant	42	16	B	15	26	1.28	.70	2786
idity	42	16	C	15	26	1.54	.89	3365
itivo	42	16	D	15	26	1.78	.89	3862
libe	48	12	A	17	30	1.26	.75	3274
lean	48	12	B	17	30	1.42	.75	3699
low	48	12	C	17	30	1.71	.75	4417
loto	48	12	D	17	30	1.96	.75	5107
nary	48	16	A	17	30	1.26	.70	3337
nois	48	16	B	17	30	1.42	.70	3762
nuse	48	16	C	17	30	1.71	.89	4523
nade	48	16	D	17	30	1.96	.89	5214
same	54	12	A	19	33	1.35	.75	4287
sand	54	12	B	19	33	1.55	.75	4945
sone	54	12	C	19	33	1.90	.75	5981
sica	54	12	D	19	33	2.23	.75	7002
sman	54	16	A	19	33	1.35	.70	4355
solie	54	16	B	19	33	1.55	.70	5013
skins	54	16	C	19	33	1.90	.89	6096
sify	54	16	D	19	33	2.23	.89	7126
ulode	60	12	A	21	36	1.39	.75	5263
ufre	60	12	B	21	36	1.67	.75	6159
ufon	60	12	C	21	36	2.00	.75	7418
udrey	60	12	D	21	36	2.38	.75	8798
udha	60	16	A	21	36	1.39	.70	5336
ugruf	60	16	B	21	36	1.67	.70	6233
ukel	60	16	C	21	36	2.00	.89	7542
ulette	60	16	D	21	36	2.38	.89	8927

All weights are approximate.

L—1100

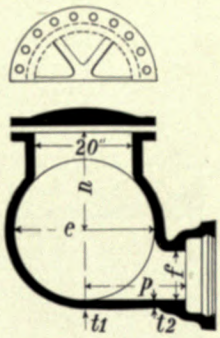


Standard Special Castings for Water

Standard Blow-off Branches with Manhole

TABLE No. 19. Code Stem, **Anef**

Approximate Weight of Cap, 290 Pounds. Code Stem, **Anit**

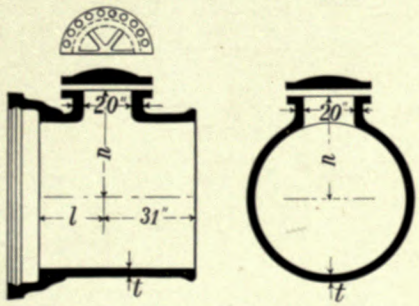


Code Terminal	Nom'l Diam. Inches		Class	l	p	n	Thickness Inches		Approximate Weight, Lbs.
	e	f					t_1	t_2	
dage	30	8	A	17	20	21	.88	.60	1628
dame	30	8	B	17	20	21	1.03	.60	1758
daria	30	8	C	17	20	21	1.20	.60	2015
dast	30	8	D	17	20	21	1.37	.60	2290
deur	30	12	A	17	20	21	.88	.75	1672
dra	30	12	B	17	20	21	1.03	.75	1803
dalt	30	12	C	17	20	21	1.20	.75	2057
dade	30	12	D	17	20	21	1.37	.75	2335
erfen	36	8	A	17	23	24	.99	.60	2045
erish	36	8	B	17	23	24	1.15	.60	2351
eone	36	8	C	17	23	24	1.36	.60	2690
emaro	36	8	D	17	23	24	1.58	.60	3071
elaso	36	12	A	17	23	24	.99	.75	2094
estro	36	12	B	17	23	24	1.15	.75	2395
esta	36	12	C	17	23	24	1.36	.75	2741
erate	36	12	D	17	23	24	1.58	.75	3122
irem	42	12	A	17	26	27	1.10	.75	2726
icar	42	12	B	17	26	27	1.28	.75	3033
ieben	42	12	C	17	26	27	1.54	.75	3595
itio	42	12	D	17	26	27	1.78	.75	4109
ikus	42	16	A	17	26	27	1.10	.70	2783
icant	42	16	B	17	26	27	1.28	.70	3090
idity	42	16	C	17	26	27	1.54	.89	3689
itivo	42	16	D	17	26	27	1.78	.89	4203
like	48	12	A	17	30	30	1.26	.75	3391
lean	48	12	B	17	30	30	1.42	.75	3803
low	48	12	C	17	30	30	1.71	.75	4497
loto	48	12	D	17	30	30	1.96	.75	5167
nary	48	16	A	17	30	30	1.26	.70	3454
nois	48	16	B	17	30	30	1.42	.70	3866
nuse	48	16	C	17	30	30	1.71	.89	4604
nade	48	16	D	17	30	30	1.96	.89	5274
same	54	12	A	19	33	33	1.35	.75	4390
sand	54	12	B	19	33	33	1.55	.75	5032
sone	54	12	C	19	33	33	1.90	.75	6039
sica	54	12	D	19	33	33	2.23	.75	7033
sinan	54	16	A	19	33	33	1.35	.70	4458
solie	54	16	B	19	33	33	1.55	.70	5100
skins	54	16	C	19	33	33	1.90	.89	6154
sify	54	16	D	19	33	33	2.23	.89	7157
ulode	60	12	A	21	36	36	1.39	.75	5357
ufre	60	12	B	21	36	36	1.67	.75	6230
ufow	60	12	C	21	36	36	2.00	.75	7462
udrey	60	12	D	21	36	36	2.38	.75	8810
udha	60	16	A	21	36	36	1.39	.70	5429
ugraf	60	16	B	21	36	36	1.67	.70	6304
ukel	60	16	C	21	36	36	2.00	.89	7587
ulette	60	16	D	21	36	36	2.38	.89	8939

L—1100

Standard Manhole Pipe

TABLE No. 20. Code Stem, **Anov**



Standard Manhole Pipe

Approximate Weight of Cap, 290 Pounds
Code Stem, **Anit**

Code Terminal	Nom'l Diam. Inches	Class	n	t	Weight Pounds	Code Terminal	Nom'l Diam. Inches	Class	n	t	Weight Pounds
enlis	30	A	21	.88	1536	**ostet**	48	A	30	1.26	3194
eola	30	B	21	1.03	1711	**ovia**	48	B	30	1.42	3610
eram	30	C	21	1.20	1973	**opiro**	48	C	30	1.71	4292
etori	30	D	21	1.37	2245	**oten**	48	D	30	1.96	4968
gramos	36	A	24	.99	1953	**ster**	54	A	33	1.35	4006
gareo	36	B	24	1.15	2260	**stien**	54	B	33	1.55	4598
gesa	36	C	24	1.36	2614	**sier**	54	C	33	1.90	5578
infer	36	D	24	1.58	3012	**sina**	54	D	33	2.23	6522
icolea	42	A	27	1.10	2535	**uisti**	60	A	36	1.39	4750
iches	42	B	27	1.28	2869	**udas**	60	B	36	1.67	5606
kem	42	C	27	1.54	3445	**utor**	60	C	36	2.00	6720
kunger	42	D	27	1.78	3971	**urist**	60	D	36	2.38	7959

L—1100

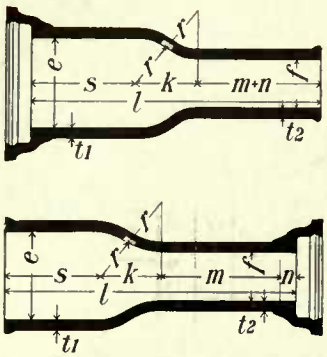
l=17 inches on 30 inches to 48 inches; 19 inches on 54 inches; 21 inches on 60 inches diameter.

All weights are approximate.

Standard Special Castings for Water

Standard Reducers and Increasers, Type No. 1

Table No. 21

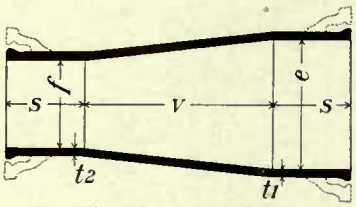


Type No. 1

Code Terminal	Diameter Inches e	Diameter Inches f	k	m	r	Thickness Inches t_1	Thickness Inches t_2	Weights Pounds Code Stems Apas Large End Bell	Weights Pounds Code Stems Apet Small End Bell
aras	6	4	3.30	14.70	3	.55	.52	99	88
anha	8	4	5.30	12.70	4	.60	.52	131	108
atico	8	6	3.90	14.10	4	.60	.55	149	138
afft	10	4	7.10	10.90	5	.68	.52	164	132
anion	10	6	6.00	12.00	5	.68	.55	181	160
anis	10	8	4.40	13.60	5	.68	.60	205	195
amus	12	6	7.90	10.10	6	.75	.55	225	191
atum	12	8	6.60	11.40	6	.75	.60	246	224
acho	12	10	4.80	13.20	6	.75	.68	271	260

Class D. 6 x 4 inches to 12 x 10 inches. On all sizes n=2 inches. L—5249
On all sizes l=30 inches and s=10 inches.

Standard Reducers and Increasers, Type No. 2



6 x 4 inches to 60 x 54 inches

Table No. 22

Code Terminal	Nominal Diameter Inches e	Nominal Diameter Inches f	v	Thickness Inches t_1	Thickness Inches t_2	Class	Weights, Pounds Code Stems Apob Spigot Ends	Asat Large End Bell	Asib Small End Bell
aras	6	4	18	.55	.52	D	82	104	97
anha	8	4	18	.60	.52	D	104	132	119
atico	8	6	18	.60	.55	D	121	150	143
afft	10	4	18	.68	.52	D	131	162	146
anion	10	6	18	.68	.55	D	150	180	169
anis	10	8	18	.68	.60	D	170	201	198
aclie	12	4	18	.75	.52	D	163	201	179
amus	12	6	18	.75	.55	D	181	218	202
atum	12	8	18	.75	.60	D	202	240	231
acho	12	10	18	.75	.68	D	229	267	261
atur	14	6	20	.66	.55	B	194	249	216
avero	14	6	20	.82	.55	D	234	288	256
arizo	14	8	20	.66	.60	B	220	275	248
averi	14	8	20	.82	.60	D	260	314	288

All weights are approximate. On all sizes s=8 inches. L—1102

UNIVERSITY OF CALIFORNIA

Standard Special Castings for Water

Standard Reducers and Increasers, Type No. 2

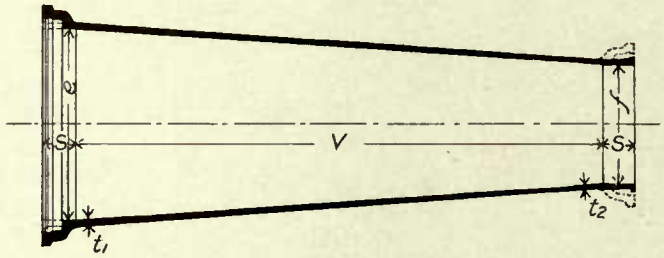
TABLE NO. 22—Continued

Code Terminal	Nominal Diameter Inches e	Nominal Diameter Inches f	v	Thickness Inches t_1	Thickness Inches t_2	Class	Weights, Pounds Code Stems Apob Spigot Ends	Asat Large End Bell	Asib Small End Bell
arate	14	10	20	.66	.68	B	250	305	279
atorem	14	10	20	.82	.68	D	290	344	320
anos	14	12	20	.66	.75	B	284	339	321
akor	14	12	20	.82	.75	D	324	378	360
avate	16	6	20	.70	.55	B	226	300	248
acibus	16	6	20	.89	.55	D	278	355	300
alite	16	8	20	.70	.60	B	252	326	280
atima	16	8	20	.89	.60	D	304	381	332
andos	16	10	20	.70	.68	B	282	356	312
barla	16	10	20	.89	.68	D	334	410	364
barot	16	12	20	.70	.75	B	317	391	353
basan	16	12	20	.89	.75	D	368	445	405
basse	16	14	20	.70	.66	B	315	389	370
bara	16	14	20	.89	.82	D	407	484	461
biate	18	8	20	.75	.60	B	287	374	315
bione	18	8	20	.96	.60	D	345	438	373
banea	18	10	20	.75	.68	B	317	404	347
bolla	18	10	20	.96	.68	D	375	468	405
brona	18	12	20	.75	.75	B	352	438	388
begi	18	12	20	.96	.75	D	410	502	446
belag	18	14	20	.75	.66	B	350	437	406
belas	18	14	20	.96	.82	D	448	541	502
belge	18	16	20	.75	.70	B	383	469	457
balk	18	16	20	.96	.89	D	492	585	569
binal	20	10	26	.80	.68	B	414	516	445
bini	20	10	26	1.03	.68	D	499	615	529
bio	20	12	26	.80	.75	B	455	556	491
biros	20	12	26	1.03	.75	D	539	656	576
brito	20	14	26	.80	.66	B	453	554	508
brom	20	14	26	1.03	.82	D	583	700	638
buron	20	16	26	.80	.70	B	490	592	564
boroi	20	16	26	1.03	.89	D	635	751	711
bucu	20	18	26	.80	.75	B	531	633	617
bonne	20	18	26	1.03	.96	D	683	800	776
cape	24	14	26	.89	.66	B	552	680	607
cift	24	14	26	1.16	.82	D	710	866	764
cire	24	16	26	.89	.70	B	589	717	663
dea	24	16	26	1.16	.89	D	762	917	838
del	24	18	26	.89	.75	B	630	758	717
deral	24	18	26	1.16	.96	D	810	965	901
deros	24	20	26	.89	.80	B	675	803	776
della	24	20	26	1.16	1.03	D	871	1027	987
dering	30	18	26	.88	.75	A	710	903	796
dellos	30	18	26	1.03	.75	B	791	969	878
ebam	30	18	26	1.20	.96	C	956	1166	1048
entib	30	18	26	1.37	.96	D	1054	1305	1146
entis	30	20	26	.88	.80	A	754	947	856

All weights are approximate. On all sizes s=8 inches. See cut on preceding page. L—1102

Standard Special Castings for Water

Standard Reducers and Increasers, Type No. 2



Long Increaser. 48 to 30 inches x 132 inches v

Table No. 22—Continued

Code Terminal	Nominal Diameter Inches		v	Thickness Inches		Class	Weights, Pounds Code Stems		
							Apob	Asat	Asib
	e	f		t_1	t_2		Spigot Ends	Large End Bell	Small End Bell
eola	30	20	26	1.03	.80	B	836	1014	937
eren	30	20	26	1.20	1.03	C	1018	1227	1134
etorl	30	20	26	1.37	1.03	D	1115	1366	1232
engra	30	20	66	.88	.80	A	1468	1661	1569
erln	30	20	66	1.03	.80	B	1626	1804	1728
ernol	30	20	66	1.20	1.03	C	1981	2190	2098
ernu	30	20	66	1.37	1.03	D	2172	2423	2289
etra	30	24	26	.88	.89	A	854	1047	981
etros	30	24	26	1.03	.89	B	935	1113	1063
enbln	30	24	26	1.20	1.16	C	1144	1354	1300
enge	30	24	26	1.37	1.16	D	1242	1493	1398
ezia	30	24	66	.88	.89	A	1661	1921	1869
eolum	30	24	66	1.03	.89	B	1820	1998	1946
emle	30	24	66	1.20	1.16	C	2228	2438	2384
etten	30	24	66	1.37	1.16	D	2419	2670	2575
erolla	36	20	32	.99	.80	A	1039	1286	1141
erlate	36	20	32	1.15	.80	B	1170	1450	1272
erarla	36	20	32	1.36	1.03	C	1417	1739	1534
eseos	36	20	32	1.58	1.03	D	1589	1951	1705
enta	36	20	66	.99	.80	A	1771	2018	1872
eble	36	20	66	1.15	.80	B	1994	2274	2095
eaba	36	20	66	1.36	1.03	C	2416	2738	2533
emie	36	20	66	1.58	1.03	D	2710	3072	2827
eces	36	24	32	.99	.89	A	1153	1339	1280
emur	36	24	32	1.15	.89	B	1283	1564	1411
erno	36	24	32	1.36	1.16	C	1562	1884	1718
ebat	36	24	32	1.58	1.16	D	1734	2096	1890
eve	36	24	66	.99	.89	A	1964	2211	2091
enui	36	24	66	1.15	.89	B	2188	2468	2314
eria	36	24	66	1.36	1.16	C	2664	2985	2820
erey	36	24	66	1.58	1.16	D	2957	3319	3113
eret	36	30	32	.99	.88	A	1243	1490	1436
eras	36	30	32	1.15	1.03	B	1467	1747	1645
eunt	36	30	32	1.36	1.20	C	1730	2051	1939
ete	36	30	32	1.58	1.37	D	2013	2375	2264

All weights are approximate. On all sizes s=8 inches. See cuts on pages 68 and 73. L—1102

Standard Special Castings for Water
Standard Reducers and Increasers, Type No. 2
TABLE No. 22—Continued

Code Terminal	Nominal Diameter Inches		v	Thickness Inches		Class	Weights, Pounds		
							Code Stems		
							Apob	**Asat**	**Asib**
	e	f		t_1	t_2		Spigot Ends	Large End Bell	Small End Bell
esse	36	30	66	.99	.89	A	2119	2366	2312
es	36	30	66	1.15	1.03	B	2502	2783	2680
ero	36	30	66	1.36	1.20	C	2950	3271	3159
ere	36	30	66	1.58	1.37	D	3434	3796	3684
exre	42	20	32	1.10	.80	A	1262	1602	1364
emen	42	20	32	1.28	.80	B	1413	1768	1515
esen	42	20	32	1.54	1.03	C	1753	2168	1869
enno	42	20	32	1.78	1.03	D	1975	2445	2092
eppe	42	20	66	1.10	.80	A	2152	2491	2254
eker	42	20	66	1.28	.80	B	2410	2764	2511
erie	42	20	66	1.54	1.03	C	2989	3405	3106
erst	42	20	66	1.78	1.03	D	3369	3839	3486
erve	42	24	32	1.10	.89	A	1376	1715	1504
era	42	24	32	1.28	.89	B	1527	1881	1654
evas	42	24	32	1.54	1.16	C	1898	2313	2053
evez	42	24	32	1.78	1.16	D	2120	2590	2276
evi	42	24	66	1.10	.89	A	2346	2685	2472
evon	42	24	66	1.28	.89	B	2603	2958	2730
evet	42	24	66	1.54	1.16	C	3237	3652	3392
evio	42	24	66	1.78	1.16	D	3616	4086	3772
infer	42	30	32	1.10	.88	A	1467	1806	1660
igar	42	30	32	1.28	1.03	B	1711	2065	1889
igadu	42	30	32	1.54	1.20	C	2065	2480	2275
igam	42	30	32	1.78	1.37	D	2399	2869	2650
igand	42	30	66	1.10	.88	A	2500	2839	2693
igar	42	30	66	1.28	1.03	B	2917	3271	3095
icall	42	30	66	1.54	1.20	C	3523	3938	3732
icet	42	30	66	1.78	1.37	D	4093	4563	4344
illus	42	36	32	1.10	.99	A	1645	1984	1891
iculo	42	36	32	1.28	1.15	B	1926	2281	2207
iaba	42	36	32	1.54	1.36	C	2320	2735	2642
itude	42	36	32	1.78	1.58	D	2714	3184	3076
irem	42	36	66	1.10	.99	A	2803	3143	3050
icar	42	36	66	1.28	1.15	B	3285	3639	3565
ieben	42	36	66	1.54	1.36	C	3958	4373	4279
itio	42	36	66	1.78	1.58	D	4631	5101	4993
idons	48	30	66	1.26	.88	A	2975	3381	3168
igra	48	30	66	1.42	1.03	B	3428	3883	3606
ilam	48	30	66	1.71	1.20	C	4092	4641	4801
iferos	48	30	66	1.96	1.37	D	4762	5388	5013
ibus	48	30	132	1.26	.88	A	5363	5769	5556
icant	48	30	132	1.42	1.03	B	6180	6635	6359
idily	48	30	132	1.71	1.20	C	7379	7928	7588
itivo	48	30	132	1.96	1.37	D	8588	9214	8839
ista	48	36	66	1.26	.99	A	3278	3684	3525
idum	48	36	66	1.42	1.15	B	3796	4252	4077
itant	48	36	66	1.71	1.36	C	4527	5076	4849

All weights are approximate. On all sizes s=8 inches. See cuts on pages 68, 70 and 73. L—1102

Standard Special Castings for Water

Standard Reducers and Increasers, Type No. 2

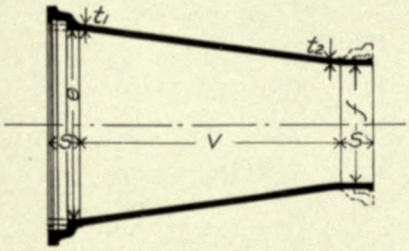
TABLE No. 22—Continued

Code Terminal	Nominal Diameter Inches		V	Thickness Inches		Class	Weights, Pounds		
							Code Stems		
							Apob	Asat	Asib
	e	f		t_1	t_1		Spigot Ends	Large End Bell	Small End Bell
ilage	48	36	66	1.96	1.58	D	5300	5925	5662
icolea	48	36	132	1.26	.99	A	5909	6316	6156
iches	48	36	132	1.42	1.15	B	6844	7299	7125
ixit	48	36	132	1.71	1.36	C	8164	8713	8485
ivit	48	36	132	1.96	1.58	D	9558	10184	9920
iras	48	42	66	1.26	1.10	A	3659	4066	3998
ipse	48	42	66	1.42	1.28	B	4212	4667	4564
ivos	48	42	66	1.71	1.54	C	5100	5649	5516
lven	48	42	66	1.96	1.78	D	5959	6585	6429
ives	48	42	132	1.26	1.10	A	6597	7003	6936
ites	48	42	132	1.42	1.28	B	7594	8049	7948
isti	48	42	132	1.71	1.54	C	9197	9746	9612
ions	48	42	132	1.96	1.78	D	10747	11373	11217
imes	54	36	66	1.35	.99	A	3722	4228	3969
ions	54	36	66	1.55	1.15	B	4330	4925	4610
ione	54	36	66	1.90	1.36	C	5259	5953	5580
inna	54	36	66	2.23	1.58	D	6181	6995	6543
inom	54	36	132	1.35	.99	A	6710	7216	6957
imus	54	36	132	1.55	1.15	B	7806	8401	8087
iez	54	36	132	1.90	1.36	C	9484	10178	9805
idao	54	36	132	2.23	1.58	D	11148	11962	11510
ical	54	42	66	1.35	1.10	A	4103	4609	4442
ian	54	42	66	1.55	1.28	B	4745	5340	5100
lack	54	42	66	1.90	1.54	C	5832	6526	6247
lard	54	42	66	2.23	1.78	D	6841	7655	7310
lake	54	42	132	1.35	1.10	A	7398	7903	7737
lamie	54	42	132	1.55	1.28	B	8556	9151	8910
lante	54	42	132	1.90	1.54	C	10517	11211	10932
lapel	54	42	132	2.23	1.78	D	12338	13152	12807
laret	54	48	66	1.35	1.26	A	4578	5083	4984
laron	54	48	66	1.55	1.42	B	5256	5851	5711
lalesi	54	48	66	1.90	1.71	C	6401	7095	6950
leaba	54	48	66	2.23	1.96	D	7512	8326	8137
leam	54	48	132	1.35	1.26	A	8253	8759	8660
lieu	54	48	132	1.55	1.42	B	9478	10073	9933
leat	54	48	132	1.90	1.71	C	11544	12239	12093
like	54	48	132	2.23	1.96	D	13550	14364	14175
lean	60	36	66	1.39	.99	A	4096	4711	4342
low	60	36	66	1.67	1.15	B	4906	5576	5186
loto	60	36	66	2.00	1.36	C	5867	6692	6189
leve	60	36	66	2.38	1.58	D	6960	7934	7322
lest	60	36	132	1.39	.99	A	7384	7999	7631
lita	60	36	132	1.67	1.15	B	8846	9516	9126
lobe	60	36	132	2.00	1.36	C	10581	11405	10902
nary	60	36	132	2.38	1.58	D	12554	13527	12916
nois	60	42	66	1.39	1.10	A	4477	5092	4816
nuse	60	42	66	1.67	1.28	B	5321	5991	5676

All weights are approximate. On all sizes s=8 inches. See cuts on pages 68, 70 and 73. L—1102

Standard Special Castings for Water

Standard Reducers and Increasers, Type No. 2



Short Increaser, 48 to 30 x 66 inches v

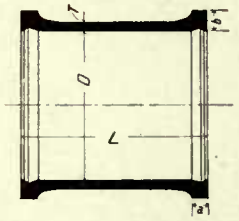
Table No. 22—Continued

Code Stems over Weight Columns							Weights, Pounds		
Code Terminal	Nominal Diameter Inches		v	Thickness Inches		Class	Code Stems		
							Apob	Asat	Asib
	e	f		t_1	t_2		Spigot Ends	Large End Bell	Small End Bell
nade	60	42	66	2.00	1.54	C	6440	7264	6855
nion	60	42	66	2.38	1.78	D	7619	8593	8089
neiz	60	42	132	1.39	1.10	A	8072	8687	8411
nera	60	42	132	1.67	1.28	B	9595	10265	9950
onbius	60	42	132	2.00	1.54	C	11614	12439	12030
ostet	60	42	132	2.38	1.78	D	13743	14716	14213
ovia	60	48	66	1.39	1.26	A	4957	5572	5363
opiro	60	48	66	1.67	1.42	B	5832	6502	6287
oten	60	48	66	2.00	1.71	C	7006	7830	7555
orgen	60	48	66	2.38	1.96	D	8285	9259	8910
ogue	60	48	132	1.39	1.26	A	8938	9552	9344
olare	60	48	132	1.67	1.42	B	10517	11187	10972
onnie	60	48	132	2.00	1.71	C	12634	13458	13183
orlos	60	48	132	2.38	1.96	D	14943	15917	15568
ollos	60	54	66	1.39	1.35	A	5404	6019	5910
orium	60	54	66	1.67	1.55	B	6348	7018	6961
occia	60	54	66	2.00	1.90	C	7750	8574	8444
oltoe	60	54	66	2.38	2.23	D	9178	10152	9992
ocol	60	54	132	1.39	1.35	A	9745	10360	10251
onet	60	54	132	1.67	1.55	B	11462	12132	12075
obes	60	54	132	2.00	1.90	C	13979	14803	14673
ocet	60	54	132	2.38	2.23	D	16557	17530	17371

All weights are approximate. On all sizes s=8 inches. See cuts on pages 68 and 70. L—1102

Standard Special Castings for Water

Standard Sleeves



For dimensions a and b see Table No. 1

Table No. 23. Code Word, **Asoc**

Code Terminal	Nom'l Diam. Inches	Class	D	L	T	Approx. Weight Pounds	Code Terminal	Nom'l Diam. Inches	Class	D	L	T	Approx. Weight Pounds
ame	4	D	5.80	10	.65	47	**icell**	36	B	39.40	15	1.40	943
andi	4	D	5.80	15	.65	61	**icet**	36	C	39.80	15	1.60	1077
atore	6	D	7.90	10	.70	68	**illus**	36	D	40.20	15	1.80	1217
acet	6	D	7.90	15	.70	87	**iculo**	36	A	39.00	24	1.25	1202
avel	8	D	10.10	12	.75	104	**iaba**	36	B	39.40	24	1.40	1362
ani	8	D	10.10	15	.75	119	**illa**	36	C	39.80	24	1.60	1563
arca	10	D	12.20	12	.80	123	**itude**	36	D	40.20	24	1.80	1772
agus	10	D	12.20	18	.80	176	**lapel**	42	A	45.30	15	1.40	1097
arie	12	D	14.30	14	.85	174	**laret**	42	B	45.60	15	1.50	1184
asis	12	D	14.30	18	.85	223	**laroi**	42	C	46.20	15	1.75	1381
anos	14	B	16.20	15	.85	220	**latesl**	42	D	46.70	15	1.95	1561
abor	14	B	16.20	18	.85	249	**leaba**	42	A	45.30	24	1.40	1577
abaris	14	D	16.50	15	.90	240	**leam**	42	B	45.60	24	1.50	1702
acity	14	D	16.50	18	.90	280	**lien**	42	C	46.20	24	1.75	1997
basse	16	B	18.50	15	.90	274	**leat**	42	D	46.70	24	1.95	2262
bara	16	B	18.50	24	.90	391	**ocet**	48	A	51 60	15	1.50	1337
beran	16	D	18.90	15	1.00	305	**omen**	48	B	51.90	15	1.65	1481
berel	16	D	18.90	24	1.00	443	**ofer**	48	C	52.50	15	1.95	1752
belge	18	B	20.60	15	.95	321	**odis**	48	D	53.10	15	2.20	1986
balk	18	B	20.60	24	.95	462	**tigab**	48	A	51.60	24	1.50	1922
bell	18	D	21.00	15	1.05	360	**toris**	48	B	51.90	24	1.65	2129
belon	18	D	21.00	24	1.05	518	**tras**	48	C	52.50	24	1.95	2532
bucu	20	B	22.70	15	1.00	374	**trud**	48	D	53.10	24	2.20	2879
bonne	20	B	22.70	24	1.00	532	**same**	54	A	57.70	15	1.60	1612
bril	20	D	23.10	15	1.15	440	**sand**	54	B	58.20	15	1.80	1835
bunt	20	D	23.10	24	1.15	625	**sone**	54	C	58.90	15	2.15	2156
deros	24	B	26.90	15	1.05	477	**slca**	54	D	59.50	15	2.45	2450
detta	24	B	26.90	24	1.05	680	**sman**	54	A	57.70	24	1.60	2316
dicort	24	D	27.40	15	1.25	583	**solie**	54	B	58.20	24	1.80	2634
diget	24	D	27.40	24	1.25	821	**skins**	54	C	58.90	24	2.15	3126
etra	30	A	32.80	15	1.15	648	**sify**	54	D	59.50	24	2.45	3571
etros	30	B	33.10	15	1.15	652	**ulode**	60	A	63.90	15	1.70	1906
enbin	30	C	33.50	15	1.32	760	**ufre**	60	B	64.50	15	1.90	2127
engo	30	D	33.80	15	1.50	876	**ufou**	60	C	65.30	15	2.25	2491
engra	30	A	32.80	24	1.15	943	**udrey**	60	D	65.90	15	2.60	2895
erin	30	B	33.10	24	1.15	949	**udha**	60	A	63.90	24	1.70	2731
ernol	30	C	33.50	24	1.32	1088	**ugruf**	60	B	64.50	24	1.90	3058
ernu	30	D	33.80	24	1.50	1262	**ukel**	60	C	65.30	24	2.25	3601
igar	36	A	39.00	15	1.25	833	**ulette**	60	D	65.90	24	2.60	4231

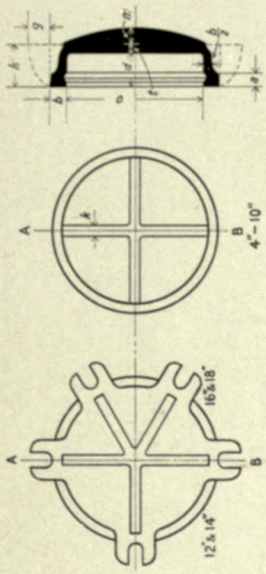
All weights are approximate.

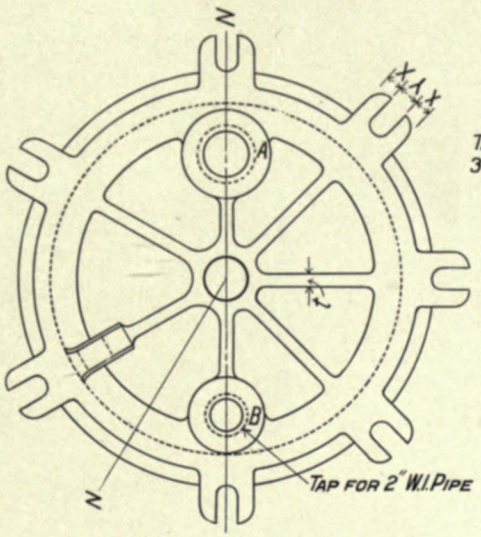
L—5324

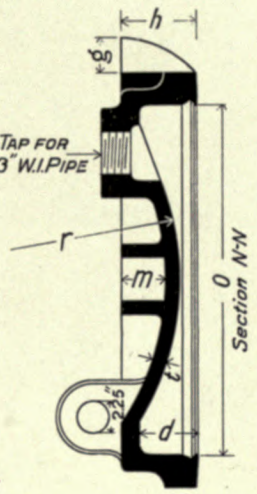
Standard Special Castings for Water

Standard Caps

TABLE No. 24. Code Word, **Asud**







Bosses A and B cast on only when so ordered

Code Terminal	Nominal Diam. Inches	Class	d	o	l	t	m	k	r	Approx. Weight Pounds
ame	4	D	4.00	5.70	....	.60	....	....	.....	26
atore	6	D	4.00	7.80	....	.65	....	....	.....	40
avel	8	D	4.00	10.00	....	.75	....	....	.....	59
arca	10	D	4.00	12.10	....	.75	1.50	.75	16.20	81
aril	12	D	4.00	14.20	....	.75	1.75	.75	18.70	104
abaris	14	B	4.00	16.10	....	.90	1.90	.75	22.40	140
acity	14	D	4.00	16.45	....	.90	1.90	.75	22.40	149
beran	16	B	4.00	18.40	....	1.00	2.00	.75	27.00	183
bevel	16	D	4.00	18.80	....	1.00	2.00	.75	27.00	198
bell	18	B	4.00	20.50	....	1.00	2.00	1.00	32.00	226
belon	18	D	4.00	20.92	....	1.00	2.00	1.00	32.90	242
bril	20	B	4.00	22.60	....	1.00	3.00	1.00	18.20	278
brint	20	D	4.00	23.06	....	1.00	3.00	1.00	18.20	308
dicort	24	B	4.00	26.80	2.50	1.05	3.50	1.00	23.50	392
digei	24	D	4.00	27.32	2.50	1.05	3.50	1.00	23.50	442
engra	30	A	4.50	32.74	2.62	1.15	3.50	1.15	34.80	589
erin	30	B	4.50	33.00	2.62	1.15	3.50	1.15	34.80	596
erol	30	C	4.50	33.40	2.62	1.15	3.50	1.15	34.80	647
ernu	30	D	4.50	33.74	2.62	1.15	3.50	1.15	34.80	704
iculo	36	A	4.50	38.96	3.12	1.25	4.00	1.25	44.00	849
iaba	36	B	4.50	39.30	3.12	1.30	3.95	1.25	44.00	918
illa	36	C	4.50	39.70	3.12	1.35	3.90	1.25	44.00	998
itude	36	D	4.50	40.16	3.12	1.40	3.85	1.25	44.00	1084
leaba	42	A	5.00	45.20	3.37	1.40	4.00	1.40	63.50	1300
leam	42	B	5.00	45.50	3.37	1.50	3.90	1.40	63.50	1388
lien	42	C	5.00	46.10	3.37	1.60	3.80	1.40	63.50	1539
leat	42	D	5.00	46.58	3.37	1.70	3.70	1.40	63.50	1679
tigab	48	A	5.00	51.50	3.62	1.70	4.00	1.50	76.50	1772
toris	48	B	5.00	51.80	3.62	1.90	3.80	1.50	76.50	1943
tras	48	C	5.00	52.40	3.62	2.00	3.70	1.50	76.50	2144
trud	48	D	5.00	52.98	3.62	2.10	3.60	1.50	76.50	2341
same	54	A	5.50	57.66	3.87	1.90	4.50	1.50	82.00	2329
sand	54	B	5.50	58.10	3.87	2.00	4.40	1.50	82.00	2519
sine	54	C	5.50	58.80	3.87	2.10	4.30	1.50	82.00	2770
sica	54	D	5.50	59.40	3.87	2.20	4.20	1.50	82.00	3009
ulode	60	A	5.50	63.80	4.12	2.00	4.50	1.50	99.00	2868
ufre	60	B	5.50	64.40	4.12	2.10	4.40	1.50	99.00	3082
ufou	60	C	5.50	65.20	4.12	2.20	4.30	1.50	99.00	3388
udrey	60	D	5.50	65.82	4.12	2.30	4.20	1.50	99.00	3687

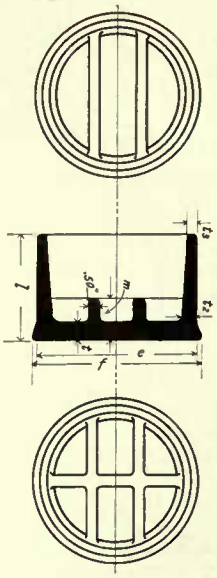
All weights are approximate.

L—5227

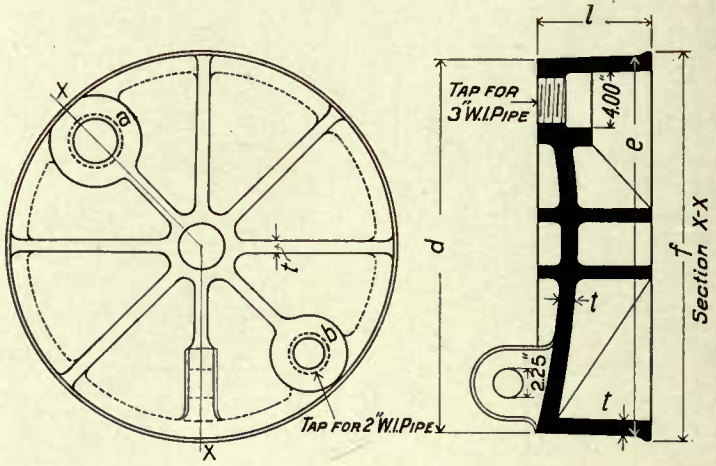
Standard Special Castings for Water

Standard Plugs

For Patent Screw Plugs, see page 119



4 to 20 inches



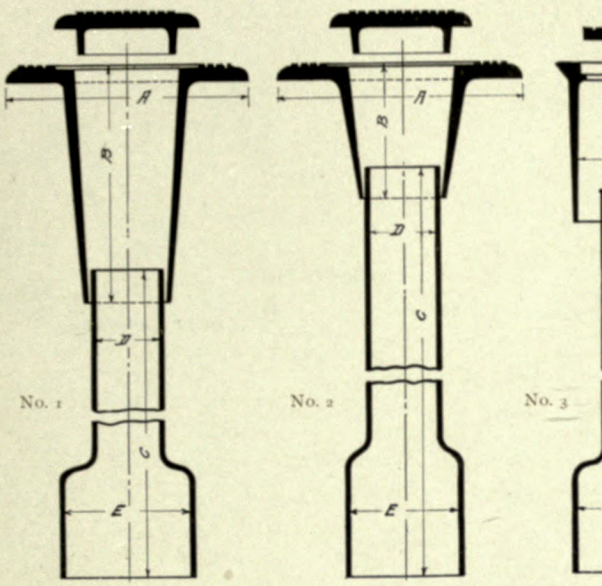
24 to 60 inches
Bosses a and b cast on only when so ordered

Table No. 25. Code Word, **Atav**

Code Terminal	Nominal Diam. Inches	Class	e	f	d	l	m	Thickness, Inches			Number of Ribs	Approx. Weight Pounds
								t	t_2	t_3		
ame	4	D	4.90	5.28	.....	5.50	....	.50	.40	.20	..	8
atore	6	D	7.00	7.38	.....	5.50	....	.60	.40	.20	..	14
avel	8	D	9.15	9.65	.....	5.50	2.0	.60	.40	.20	2	24
arca	10	D	11.20	11.70	.....	6.00	2.0	.70	.50	.20	2	38
arli	12	D	13.30	13.80	.....	6.00	2.0	.75	.50	.20	2	50
abaris	14	B	15.30	15.80	.....	6.00	2.0	.70	.50	.20	2	63
acity	14	D	15.65	16.15	.....	6.00	2.0	.75	.50	.20	2	65
beran	16	B	17.40	17.90	.....	6.50	2.0	.70	.50	.30	3	90
bevel	16	D	17.80	18.30	.....	6.50	2.0	.80	.60	.30	3	96
beli	18	B	19.50	20.00	.....	6.50	2.50	.75	.60	.30	3	111
belon	18	D	19.92	20.42	.....	6.50	2.50	.85	.60	.30	3	121
brii	20	B	21.60	22.10	.....	6.50	2.75	.85	.60	.30	3	151
brint	20	D	22.06	22.56	.....	6.50	2.75	1.00	.60	.30	3	156
dicort	24	B	25.92	26.30	25.68	8.0	....	.89	...	...	4	375
digli	24	D	26.44	26.82	26.20	8.0	....	1.16	...	...	4	472
engra	30	A	31.86	32.24	31.62	8.0	....	.88	...	...	4	481
erin	30	B	32.12	32.50	31.88	8.0	....	1.03	...	...	4	556
ernol	30	C	32.52	32.90	32.28	8.0	....	1.20	...	...	4	641
ernu	30	D	32.86	33.24	32.62	8.0	....	1.37	...	...	4	723
iculo	36	A	38.08	38.46	37.84	8.0	....	.99	...	...	4	682
iabra	36	B	38.42	38.80	38.18	8.0	....	1.15	...	...	4	786
ilia	36	C	38.82	39.20	38.58	8.0	....	1.36	...	...	4	914
itude	36	D	39.28	39.66	39.04	8.0	....	1.58	...	...	4	1050
leaba	42	A	44.32	44.70	44.08	9.0	....	1.10	...	...	4	991
leam	42	B	44.62	45.00	44.38	9.0	....	1.28	...	...	4	1138
lien	42	C	45.22	45.60	44.98	9.0	....	1.54	...	...	4	1353
leat	42	D	45.70	46.08	45.46	9.0	....	1.78	...	...	4	1551
tigab	48	A	50.62	51.00	50.38	9.0	....	1.26	...	...	4	1349
toris	48	B	50.92	51.30	50.68	9.0	....	1.42	...	...	4	1506
tras	48	C	51.52	51.90	51.28	9.0	....	1.71	...	...	4	1800
trud	48	D	52.10	52.48	51.86	9.0	....	1.96	...	...	4	2047
same	54	A	56.78	57.16	56.54	9.0	....	1.35	...	...	4	1697
sand	54	B	57.22	57.60	56.98	9.0	....	1.55	...	...	4	1945
sone	54	C	57.92	58.30	57.68	9.0	....	1.90	...	...	4	2356
sica	54	D	58.52	58.90	58.28	9.0	....	2.23	...	...	4	2733
ulode	60	A	62.92	63.30	62.68	9.0	....	1.39	...	...	4	2045
ufre	60	B	63.52	63.90	63.28	9.0	....	1.67	...	...	4	2434
ufou	60	C	64.32	64.70	64.08	9.0	....	2.00	...	...	4	2904
udrey	60	D	64.94	65.32	64.70	9.0	....	2.38	...	...	4	3397

All weights are approximate.

L—4821

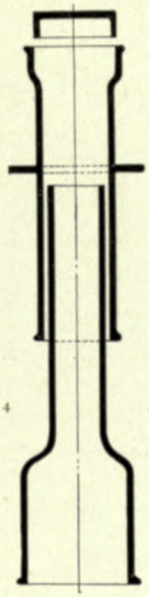


Standard Special Castings

Tubes Nos. 1, 2 and 3 are interchangeable.

The top section of Nos. 1 and 2 are for macadam.

The top section of No. 3 is for granite, asphalt or brick.



Valve Boxes, Nos. 1, 2 and 3. Table No. 26

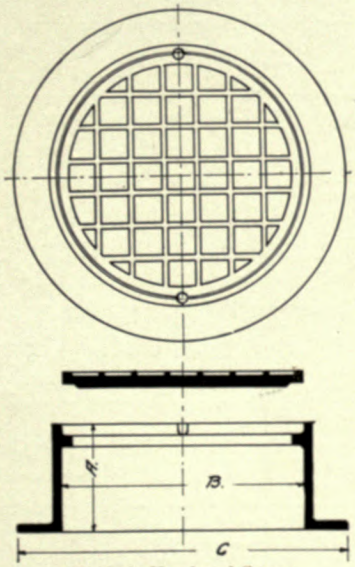
Code Terminal	Valve Box No.	A	B	C	D	E	Approx. Weights Pounds Top Code **Afod**	Lid Code **Avof**	Tube Code **Avur**
ani	1	18.50	18.00	34.00	4.75	9.50	144	32	62
acti	2	18.50	10.25	28.00	5.00	8.00	96	32	47
ance	3	9.25	12.00	48.00	4.75	9.50	58	14	75

P—23

Valve Box No. 4. Table No. 27. Code Word, **Baba**

Code Terminal	Length Inches Adjustable from	Inside Diam. Upper Case Inches	Inside Diam. Box Bottom Inches	Approx. Weight Pounds
bias	16 to 24	6.00	8.00	110
biam	24 to 32	6.13	8.75	130
begi	36 to 60	6.13	8.75	200
baik	48 to 72	6.13	8.75	228
bell	72 to 96	6.13	8.75	288

P—24 Burl.—X No. 56, Fol. 2



Manhole Head and Cover
Philadelphia Pattern

Manhole Head and Cover Philadelphia Pattern Table No. 28 Code Word, **Bac**

Code Terminal	A	B	C	Approx. Weight Pounds
ame	5.50	22	30	257
avel	9.75	22	30	317

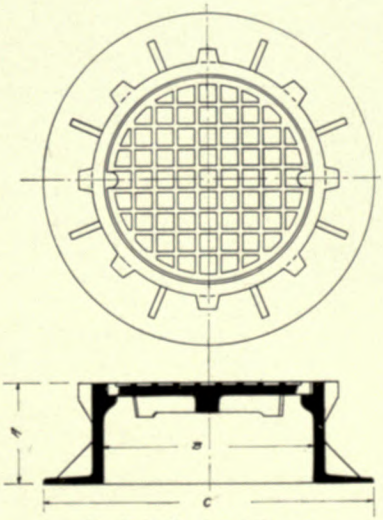
P—55

Manhole Head and Cover New York Pattern Table No. 29 Code Word, **Badi**

Code Terminal	A	B	C	Approx. Weight Pounds
bell	12	25	38.50	680

P—26

All weights are approximate.

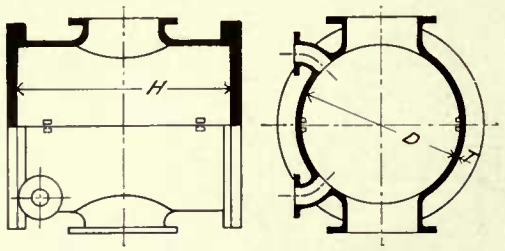


Manhole Head and Cover
New York Pattern

Standard Special Castings, Extras

Particulars and prices on application

Standard Screen Pot, Complete with Copper Screen

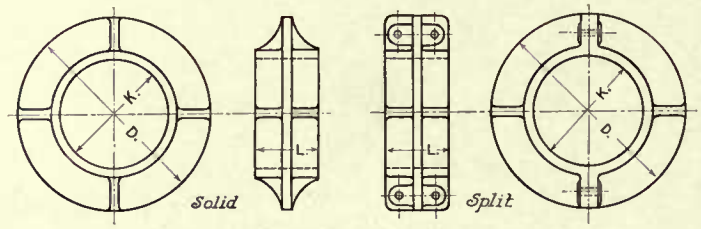


Screen Pots of special design and sizes made to order.

Outlets with standard flanges—Flanges faced only—Drilled to order

Screen Pots. Table No. 30. Code Word, **Baf**

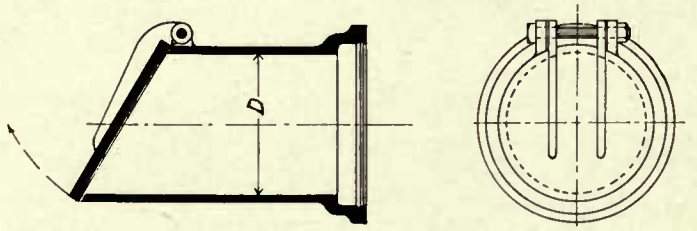
Code Terminal	D	H	Approx. Weight Pounds
engra	30	42	2350
iculo	36	48	3310
lleu	42	54	4370



Standard Puddle Collars

Puddle Collars. Table No. 32

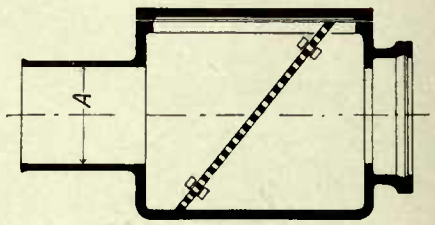
Code Terminal	Used with Diam. Inches	L	D	K	Approx. Weight Pounds	
					Solid	Split
					Code **Bel**	Code **Bem**
ame	4	5.00	13.00	5.25	35	38
atore	6	5.50	15.50	7.41	53	57
avel	8	6.00	18.00	8.65	71	76
arca	10	7.00	20.25	11.80	90	96
aril	12	8.00	23.00	13.93	122	130
abarls	14	9.00	25.50	16.15	184	193
beran	16	10.00	28.00	18.35	230	240
bell	18	10.50	30.50	20.62	280	290
brll	20	11.00	33.00	22.71	325	336
dicort	24	11.50	38.00	27.07	421	433



Tidal and Flume Gates are made from Class B Pipe. Length is measured on axis of pipe

All weights are approximate.

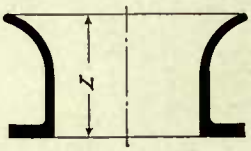
Standard Fish Traps



Fish Screens complete with screen and hand-hole

Table No. 31. Code Word **Bagu**

Code Terminal	A	Approx. Weight Pounds
amus	8	220
bero	10	378
bio	12	470
eras	16	840
eppe	20	1495
iez	24	2210



Bell Mouth

Table No. 33. Code Word **Bens**

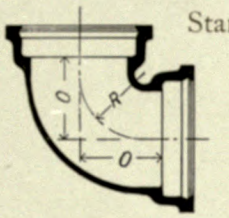
Code Terminal	Nominal Diam. Inches	L Inches	Approx. Weight Pounds
andi	4	8	25
aca	6	8	36
amus	8	10	56
bero	10	10	77
bio	12	10	103
eces	14	10	124
eras	16	10	152
evon	18	10	177
eppe	20	12	237
iez	24	12	309

Tidal and Flume Gates

Table No. 34. Code Word **Ber**

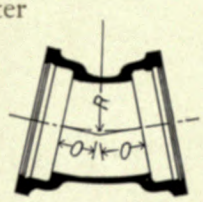
Code Terminal	D	Approx. Weight 2 ft. Long Pounds	Approx. Weight each additional ft. Pounds
bio	12	290	74
eras	16	410	114
eppe	20	600	163
iez	24	790	220

Standard Condensed Special Castings for Water



Condensed ¼ Bend

Condensed ⅛ Bend



Condensed 1/16 Bend

Table No. 35. Code, **Bis**

Code Terminal	Nominal Diam. Inches	Class	O	R	Approximate Weight Pounds
ame	4	D	4	4	58
atore	6	D	6	6	94
avel	8	D	8	6	143
arca	10	D	8	6	211
aril	12	D	10	8	299
anos	14	B	12	10	330
abor	14	D	12	10	387
basse	16	B	12	10	416
bara	16	D	12	10	498
belge	18	B	14	12	531
balk	18	D	14	12	645
bucu	20	B	14	12	627
bonne	20	D	14	12	782
deros	24	B	16	14	874
della	24	D	16	14	1125

P—101

Table No. 36. Code, **Bod**

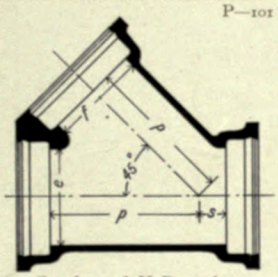
Code Terminal	Nominal Diam. Inches	Class	O	R	Approximate Weight Pounds
ame	4	D	1.63	4	53
atore	6	D	2.50	6	81
avel	8	D	3.31	8	113
arca	10	D	4.13	10	178
aril	12	D	5.00	12	245
anos	14	B	5.81	14	265
abor	14	D	5.81	14	305
basse	16	B	6.63	16	351
bara	16	D	6.63	16	415
belge	18	B	7.45	18	436
balk	18	D	7.45	18	521
bucu	20	B	8.25	20	550
bonne	20	D	8.25	20	675
deros	24	B	10.00	24	755
della	24	D	10.00	24	955

P—101

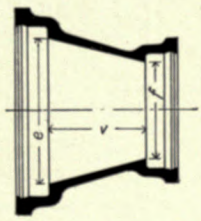
Table No. 37. Code, **Bup**

Code Terminal	Nominal Diam. Inches	Class	O	R	Approximate Weight Pounds
ame	4	D	1.63	8	53
atore	6	D	2.50	12	81
avel	8	D	3.31	16	115
arca	10	D	4.13	20	180
aril	12	D	5.00	24	248
anos	14	B	5.81	28	268
abor	14	D	5.81	28	307
basse	16	B	6.62	32	355
bara	16	D	6.62	32	419
belge	18	B	7.45	36	441
balk	18	D	7.45	36	527
bucu	20	B	8.25	40	555
bonne	20	D	8.25	40	688
deros	24	B	10.00	48	765
della	24	D	10.00	48	965

P—101



Condensed Y Branches



Condensed Reducers

Table No. 38. Code, **Cab**

Code Terminal	Nominal Diam. Inches e	Nominal Diam. Inches f	Class	p	s	Approximate Weight Pounds
ame	4	4	D	8.5	1.50	90
atore	6	6	D	11.0	2.40	135
avel	8	8	D	13.5	2.75	197
arca	10	10	D	16.0	3.25	319
aril	12	12	D	18.5	3.50	435
abaris	14	14	B	21.6	4.25	494
acity	14	14	D	21.6	4.25	558
beran	16	16	B	24.7	5.00	706
bevel	16	16	D	24.7	5.00	849
bell	18	18	B	27.8	5.75	899
belon	18	18	D	27.8	5.75	1099
bril	20	20	B	30.9	6.00	1110
bunt	20	20	D	30.9	6.00	1393
dicort	24	24	B	34.0	7.00	1527
digli	24	24	D	34.0	7.00	1960

P—102

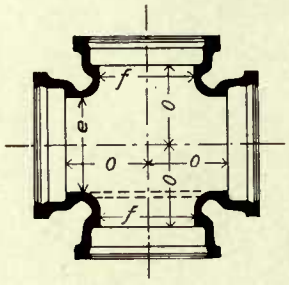
Table No. 39. Code, **Ceg**

Code Terminal	Nominal Diam. Inches e	Nominal Diam. Inches f	Class	V	Approximate Weight Pounds
aras	6	4	D	4	76
anha	8	4	D	8	97
atico	8	6	D	4	100
afft	10	4	D	12	135
anion	10	6	D	8	132
anis	10	8	D	4	137
amus	12	6	D	12	183
atum	12	8	D	8	183
acho	12	10	D	4	178
arizo	14	8	B	12	213
averi	14	8	D	12	233
arate	14	10	B	8	209
atorem	14	10	D	8	217
anos	14	12	B	4	207
akor	14	12	D	4	217
andos	16	10	B	12	272
barla	16	10	D	12	292
barot	16	12	B	8	269
basan	16	12	D	8	294
basse	16	14	B	4	237
bara	16	14	D	4	269
brona	18	12	B	12	337
begi	18	12	D	12	374
belag	18	14	B	8	302
belas	18	14	D	8	349
belge	18	16	B	4	292
balk	18	16	D	4	335
brilo	20	14	B	12	375
brom	20	14	D	12	450
buron	20	16	B	8	364
boroi	20	16	D	8	437
bucu	20	18	B	4	344
bonne	20	18	D	4	407
cire	24	16	B	16	537
dea	24	16	D	16	670
del	24	18	B	12	516
deral	24	18	D	12	648
deros	24	20	B	8	486
della	24	20	D	8	508

P—102

All weights are approximate.

Standard Condensed Special Castings for Water



Tees and Crosses

TABLE No. 40. Condensed Tees and Crosses

Code Terminal	Nominal Diameter Inches		Class	O	Approximate Weights Pounds	
					Tees	Crosses
	e	f			Code **Cis**	Code **Cod**
ame	4	4	D	4	84	109
aras	6	4	D	6	124	152
atore	6	6	D	6	140	181
anha	8	4	D	8	197	225
atico	8	6	D	8	207	245
avei	8	8	D	8	226	283
afft	10	4	D	8	248	271
anion	10	6	D	8	260	293
anis	10	8	D	8	278	335
arca	10	10	D	8	295	360
aclle	12	4	D	10	349	372
amus	12	6	D	10	359	385
atum	12	8	D	10	380	435
acho	12	10	D	10	395	462
arli	12	12	D	10	417	503
abunt	14	4	B	12	392	415
andum	14	4	D	12	455	480
atur	14	6	B	12	403	436
avero	14	6	D	12	467	501
arizo	14	8	B	12	418	470
averi	14	8	D	12	482	534
arate	14	10	B	12	431	496
atorem	14	10	D	12	495	560
anos	14	12	B	12	451	536
abor	14	12	D	12	515	600
abaris	14	14	B	12	460	549
acity	14	14	D	12	530	625
arage	16	4	B	12	487	516
agno	16	4	D	12	581	610
avate	16	6	B	12	500	542
acibus	16	6	D	12	594	636
alite	16	8	B	12	523	588
atima	16	8	D	12	617	682
andos	16	10	B	12	541	624
barla	16	10	D	12	635	718
barot	16	12	B	12	567	676
basan	16	12	D	12	661	770
basse	16	14	B	12	576	694
bara	16	14	D	12	678	804
beran	16	16	B	12	601	744
bevel	16	16	D	12	717	886
bero	18	4	B	14	631	660
blas	18	4	D	14	750	779
biam	18	6	B	14	646	690
biolan	18	6	D	14	765	809
blate	18	8	B	14	671	740
blone	18	8	D	14	790	859

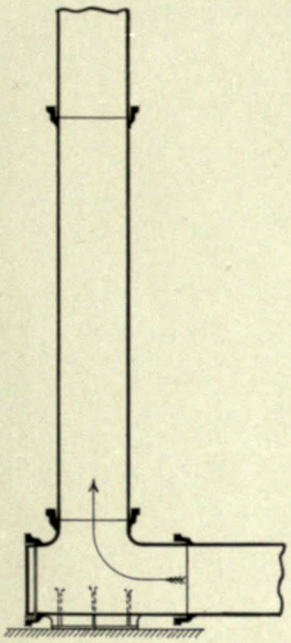
Code Terminal	Nominal Diameter Inches		Class	O	Approximate Weights Pounds	
					Tees	Crosses
	e	f			Code **Cis**	Code **Cod**
bouca	18	10	B	14	690	778
boila	18	10	D	14	809	897
brona	18	12	B	14	719	836
begl	18	12	D	14	838	955
belag	18	14	B	14	722	842
belas	18	14	D	14	849	977
belge	18	16	B	14	754	904
baik	18	16	D	14	898	1075
bell	18	18	B	14	783	964
belon	18	18	D	14	933	1145
belrad	20	4	B	14	725	754
benk	20	4	D	14	901	930
beure	20	6	B	14	738	780
berd	20	6	D	14	914	956
biene	20	8	B	14	761	826
bill	20	8	D	14	937	1002
binal	20	10	B	14	779	862
bini	20	10	D	14	955	1038
bio	20	12	B	14	805	914
biros	20	12	D	14	981	1090
brito	20	14	B	14	813	925
brom	20	14	D	14	998	1124
buron	20	16	B	14	839	982
boroi	20	16	D	14	1037	1202
bucu	20	18	B	14	865	1034
bonne	20	18	D	14	1070	1268
bril	20	20	B	14	895	1094
bunt	20	20	D	14	1114	1356
back	24	6	B	16	1023	1065
biolus	24	6	D	16	1309	1351
buis	24	8	B	16	1046	1111
berto	24	8	D	16	1332	1397
borne	24	10	B	16	1064	1147
card	24	10	D	16	1350	1433
cana	24	12	B	16	1090	1199
carlo	24	12	D	16	1376	1485
cape	24	14	B	16	1097	1212
ciit	24	14	D	16	1395	1521
cire	24	16	B	16	1124	1267
dea	24	16	D	16	1432	1597
del	24	18	B	16	1150	1319
deral	24	18	D	16	1465	1663
deros	24	20	B	16	1180	1379
della	24	20	D	16	1509	1751
dicort	24	24	B	16	1237	1489
digli	24	24	D	16	1591	1914

All weights are approximate.

P—100

Standard Special Castings, Extras

Smoke Flues. Coal Chutes



Smoke Flue, Type 1

Table No. 41. Smoke Flues

Type 1. Code Word, **Cum**
Type 2. Code Word, **Dab**

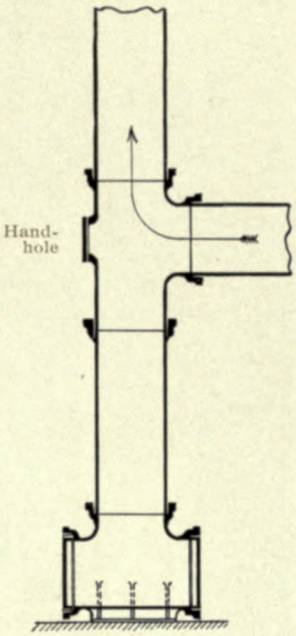
Code Terminal	Nominal Diameter Inches
bucu	20
deros	24
etra	30
igar	36
lapel	42
ocet	48
same	54
ulode	60

Smoke Flues are made up with base tees and B. & S. pipe.

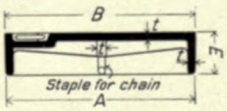
The hand-hole on Type 2 is cast onto standard tees, Table No. 14.

For weights of base tees see Table No. 15.

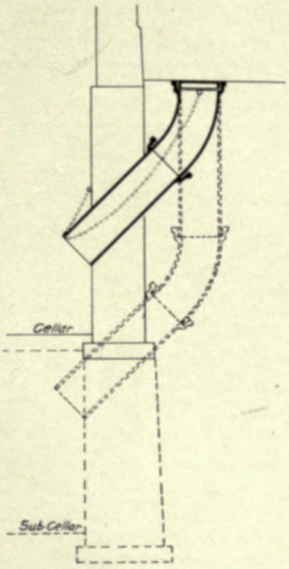
For weights of straight pipe see Table No. 2.



Smoke Flue, Type 2



Cap for Coal Chute



Coal Chute. Code Word, **Det**

Table No. 42

Coal Chutes
Code Word, **Det**

Caps for Coal Chutes
Code Word, **Dir**

Code Terminal	Nominal Diameter Inches	A	B	E	t	Approx. Weight Pounds
bucu	20	21.48	21.72	4.00	.75	121
deros	24	25.68	25.92	4.00	.75	162
etra	30	31.62	31.86	4.50	.88	277
igar	36	37.84	38.08	4.50	.88	375
lapel	42	44.08	44.32	5.00	1.00	567
ocet	48	50.38	50.62	5.00	1.00	716
same	54	56.54	56.78	5.50	1.00	880
ulode	60	62.68	62.92	5.50	1.00	1055

Coal chutes are made up with ⅛ curves and B. & S. pipe. L—5231

For ⅛ curves see Table No. 10.

For B. & S. pipe see Table No. 2.

Caps are made with checkered surface or recessed for cement or asphalt.

Standard Flanged Pipe for Water

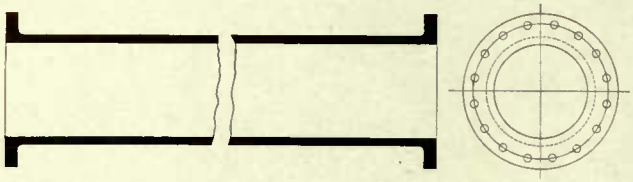


TABLE NO. 43

Code Term'l	Nominal Diameter, Inches	Diameter of Flange, Inches	Diameter of Bolt Circle, Inches	Number of Bolts	Class A 100 Foot Head, 43 Pounds Pressure — Code Word, **Doc**						Class B 200 Foot Head, 86 Pounds Pressure — Code Word, **Dul**					
					Thickness, Inches	Weight, Pounds per Foot	Weight, Pounds per Length	Weight, Pounds per Single Flange	Diameter Bolts Inches	Weight Bolts Single Joint, Lbs.	Thickness, Inches	Weight, Pounds per Foot	Weight, Pounds per Length	Weight, Pounds per Single Flange	Diameter Bolts Inches	Weight Bolts Single Joint, Lbs.
aca	3	7.50	6.00	4	.39	13.0	168.0	5.8	½	1.0	.42	14.6	188.0	6.3	½	1.2
ame	4	9.00	7.50	4	.42	18.0	234.0	9.0	⅝	2.0	.45	20.1	259.0	9.1	⅝	2.0
atore	6	11.00	9.50	8	.44	27.9	358.0	11.8	⅝	4.0	.48	31.1	398.0	12.3	⅝	4.0
avel	8	13.50	11.75	8	.46	38.7	498.0	16.9	⅝	4.0	.51	42.7	549.0	18.2	⅝	4.0
arca	10	16.00	14.25	12	.50	51.9	671.0	23.9	¾	10.0	.57	58.8	759.0	26.6	¾	10.0
aril	12	19.00	17.00	12	.54	67.0	876.0	35.8	¾	10.0	.62	76.4	998.0	40.4	¾	10.0
abaris	14	21.00	18.75	12	.57	82.3	1070.0	41.4	⅞	15.0	.66	94.7	1231.0	47.3	⅞	16.0
beran	16	23.50	21.25	16	.60	98.8	1290.0	52.5	⅞	21.5	.70	114.6	1495.0	60.1	⅞	22.0
bell	18	25.00	22.75	16	.64	118.3	1528.0	54.5	1	30.0	.75	137.8	1779.0	62.5	1	32.0
bril	20	27.50	25.00	20	.67	137.4	1783.0	66.8	1	37.0	.80	163.1	2114.0	78.7	1	40.0
dicort	24	32.00	29.50	20	.76	186.5	2424.0	92.9	1	40.0	.89	217.3	2821.0	106.8	1	42.0
engra	30	38.75	36.00	28	.88	266.1	3486.0	146.1	1⅛	87.0	1.03	312.6	4077.0	162.9	1⅛	91.0
iculo	36	45.75	42.75	32	.99	358.7	4733.0	214.6	1⅛	100.0	1.15	418.7	5497.0	236.6	1⅛	104.0
ista	40	50.75	47.50	32	1.06	427.2	5684.0	279.1	1¼	119.0	1.23	497.0	6586.0	311.2	1¼	125.0
lien	42	52.75	49.50	36	1.10	464.6	6178.0	301.3	1¼	137.0	1.28	542.2	7178.0	335.9	1¼	143.0
tras	48	59.50	56.00	44	1.26	608.0	8112.0	408.1	1⅜	231.0	1.42	687.2	9132.0	442.9	1⅜	240.0

					Class C 300 Foot Head, 130 Pounds Pressure — Code Word, **Ebal**						Class D 400 Foot Head, 173 Pounds Pressure — Code Word, **Ebem**					
aca	3	7.50	6.00	4	.45	15.5	199.0	6.6	⅝	2.0	.48	16.4	211.0	7.1	⅝	2.0
ame	4	9.00	7.50	4	.48	21.3	275.0	9.7	¾	3.0	.52	22.8	295.0	10.4	¾	3.5
atore	6	11.00	9.50	8	.51	32.9	421.0	12.8	¾	6.5	.55	35.3	451.0	13.7	¾	6.5
avel	8	13.50	11.75	8	.56	48.0	614.0	19.0	¾	6.5	.60	51.2	654.0	20.1	¾	6.5
arca	10	16.00	14.25	12	.62	65.5	840.0	27.3	⅞	16.0	.68	71.4	916.0	29.6	⅞	16.0
aril	12	19.00	17.00	12	.68	85.4	1109.0	42.0	⅞	16.0	.75	93.7	1216.0	45.6	⅞	16.0
abaris	14	21.00	18.75	12	.74	108.1	1397.0	49.6	1	24.0	.82	119.2	1539.0	54.5	1	24.0
beran	16	23.50	21.25	16	.80	133.3	1727.0	63.9	1	33.0	.89	147.5	1910.0	70.2	1	33.0
bell	18	25.00	22.75	16	.87	162.4	2083.0	66.9	1⅛	49.0	.96	178.4	2287.0	73.4	1⅛	50.0
bril	20	27.50	25.00	20	.92	190.6	2454.0	83.3	1⅛	62.0	1.03	212.3	2731.0	92.1	1⅛	63.0
dicort	24	32.00	29.50	20	1.04	257.6	3321.0	114.7	1¼	75.0	1.16	286.0	3686.0	126.9	1¼	78.0
engra	30	38.75	36.00	28	1.20	366.9	4759.0	178.1	1⅜	144.0	1.37	421.2	5436.0	191.0	1⅜	150.0
iculo	36	45.75	42.75	32	1.36	497.7	6500.0	263.8	1⅜	171.0	1.58	581.9	7555.0	286.0	1⅜	181.0
ista	40	50.75	47.50	32	1.48	601.6	7921.0	350.7	1½	219.0	1.72	703.4	9203.0	389.0	1½	231.0
lien	42	52.75	49.50	36	1.54	657.4	8635.0	373.0	1½	251.0	1.78	764.1	9973.0	402.0	1½	264.0
tras	48	59.50	56.00	44	1.71	832.7	10979.0	493.4	1½	312.0	1.96	960.8	12578.0	524.3	1½	334.0

NOTE—Thickness of flange equals approximately 1½ times thickness of pipe plus ⅛ inch. Pipe made in 12 foot lengths and faced $\frac{1}{16}$ inch short for gaskets. All dimensions in inches. Above are neat finished weights. Allowance must be made for variation and finish.

All weights are approximate.

Standard Flanged Pipes—Short Lengths for Water

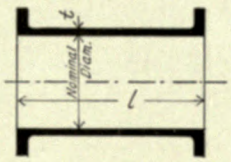


Table No. 44

Code Terminal	Nom'l Diam., Inches	Length l, Inches	Thickness, In. Class A	Class B	Class C	Class D	Weights, Pounds Class A Code Ebin	Class B Code Ebop	Class C Code Ecam	Class D Code Ecip
andi	4	6	.42	.45	.48	.52	27	28	29	32
acet	4	12	.42	.45	.48	.52	36	38	41	43
ani	4	18	.42	.45	.48	.52	45	48	52	55
agus	4	24	.42	.45	.48	.52	54	58	63	66
acti	4	30	.42	.45	.48	.52	63	68	73	77
asis	4	36	.42	.45	.48	.52	72	78	84	89
anes	4	48	.42	.45	48	.52	90	98	105	112
ance	4	60	.42	.45	.48	.52	108	118	127	134
asti	4	72	.42	.45	.48	.52	126	138	148	157
aca	6	6	.44	.48	.51	.55	38	40	42	44
ame	6	12	.44	.48	.51	.55	52	55	59	62
alizo	6	18	.44	.48	.51	.55	66	71	75	80
aras	6	24	.44	.48	.51	.55	79	86	91	103
atore	6	30	.44	.48	.51	.55	93	102	108	115
anha	6	36	.44	.48	.51	.55	107	117	124	132
avel	6	48	.44	.48	.51	.55	135	148	157	168
anis	6	60	.44	.48	.51	.55	164	179	190	203
arca	6	72	.44	.48	.51	.55	191	210	223	238
amus	8	6	.46	.51	.56	.60	53	57	62	65
atum	8	12	.46	.51	.56	.60	73	78	86	91
acho	8	18	.46	.51	.56	.60	92	100	110	117
aril	8	24	.46	.51	.56	.60	111	122	134	143
atur	8	30	.46	.51	.56	.60	130	143	158	168
anos	8	36	.46	.51	.56	.60	150	164	182	194
abor	8	48	.46	.51	.56	.60	188	207	230	245
agno	8	60	.46	.51	.56	.60	227	249	278	296
bara	8	72	.46	.51	.56	.60	266	292	326	347
bero	10	6	.50	.57	.62	.68	74	83	87	95
bias	10	12	.50	.57	.62	.68	100	112	120	131
biam	10	18	.50	.57	.62	.68	126	142	152	167
begi	10	24	.50	.57	.62	.68	152	171	185	202
balk	10	30	.50	.57	.62	.68	178	201	218	238
bell	10	36	.50	.57	.62	.68	204	230	251	274
benk	10	48	.50	.57	.62	.68	256	289	316	345
berd	10	60	.50	57	.62	.68	308	348	382	417
bini	10	72	.50	.57	.62	.68	360	406	447	488
bio	12	6	.54	.62	.68	.75	106	118	127	138
brom	12	12	.54	.62	.68	.75	139	157	169	184
bucu	12	18	.54	.62	.68	.75	172	195	212	231
bril	12	24	.54	.62	.68	.75	206	233	255	278
buis	12	30	.54	.62	.68	.75	239	271	298	325
enta	12	36	.54	.62	.68	.75	273	310	340	371
ebe	12	48	.54	.62	.68	.75	340	386	426	465
eaba	12	60	.54	.62	.68	.75	407	462	511	559
emie	12	72	.54	.62	.68	.75	474	539	596	651
eces	14	6	.57	.66	.74	.82	123	141	154	170
emur	14	12	.57	.66	.74	.82	165	189	208	229
emo	14	18	.57	.66	.74	.82	206	236	262	289
ebat	14	24	.57	.66	.74	.82	247	284	316	350
eor	14	30	.57	.66	.74	.82	288	331	370	408
enni	14	36	.57	.66	.74	.82	329	378	364	467
eria	14	48	.57	.66	.74	.82	411	473	532	586
erez	14	60	.57	.66	.74	.82	493	567	640	706
eret	14	72	.57	.66	.74	.82	576	622	748	825
eras	16	6	.60	.70	.80	.89	153	177	195	214
eunt	16	12	.60	.70	.80	.89	204	235	261	288
ete	16	18	.60	.70	.80	.89	254	292	328	361
esse	16	24	.60	.70	.80	.89	303	349	394	435
es	16	30	.60	.70	.80	.89	353	407	461	509
ero	16	36	.60	.70	.80	.89	402	464	528	582
ere	16	48	.60	.70	.80	.89	501	579	661	730
evio	16	60	.60	.70	.80	.89	600	693	794	877
evet	16	72	.60	.70	.80	.89	697	807	927	1025
evon	18	6	.64	.75	.87	.96	169	192	215	235
evi	18	12	.64	.75	.87	.96	228	263	296	326
evez	18	18	.64	.75	.87	.96	287	332	378	415
evas	18	24	.64	.75	.87	.96	346	401	459	503
eva	18	30	.64	.75	.87	.96	405	470	540	582
erve	18	36	.64	.75	.87	.96	458	539	621	682
erst	18	48	.64	.75	.87	.96	582	677	784	850
erre	18	60	.64	.75	.87	.96	701	815	946	1038
eper	18	72	.64	.75	.87	.96	819	952	1108	1217
eppe	20	6	.67	.80	.92	1.03	202	238	261	290
enno	20	12	.67	.80	.92	1.03	271	321	357	396
esen	20	18	.67	.80	.92	1.03	340	402	452	503
emen	20	24	.67	.80	.92	1.03	409	484	548	609
evve	20	30	.67	.80	.92	1.03	477	565	643	715
ions	20	36	.67	.80	.92	1.03	546	647	738	821
ione	20	48	.67	.80	.92	1.03	673	810	929	1034
inna	20	60	.67	.80	.92	1.03	821	973	1119	1246
inom	20	72	.67	.80	.92	1.03	958	1136	1310	1459
iez	24	6	.76	.89	1.04	1.16	279	322	359	397
idas	24	12	.76	.89	1.04	1.16	373	431	487	540
ical	24	18	.76	.89	1.04	1.16	466	540	616	683
ian	24	24	.76	.89	1.04	1.16	559	649	745	826
ipse	24	30	.76	.89	1.04	1.16	659	757	874	969
ivor	24	36	.76	.89	1.04	1.16	746	876	1003	1112
iven	24	48	.76	.89	1.04	1.16	933	1083	1260	1398
ivit	24	60	.76	.89	1.04	1.16	1119	1301	1518	1684
ives	24	72	.76	.89	1.04	1.16	1306	1518	1775	1970

See Table No. 43 for flange diameters, bolt circles, etc.
All weights are approximate.

P—52 A

Standard Flange and Bell Pipe—Short Lengths

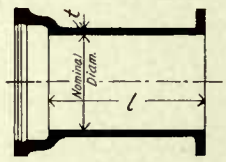


Table No. 45

Code Terminal	Nom'l Diam., Inches	Length l, Inches	Thickness, In. Class A	Class B	Class C	Class D	Weights, Pounds Class A Code Ecos	Class B Code Edan	Class C Code Edep	Class D Code Edis
andi	4	6	.42	.45	.48	.52	36	39	42	45
acet	4	12	.42	.45	.48	.52	45	49	52	56
ani	4	18	.42	.45	.48	.52	54	59	63	68
agus	4	24	.42	.45	.48	.52	63	69	74	79
acti	4	30	.42	.45	.48	.52	72	79	85	90
asis	4	36	.42	.45	.48	.52	81	89	95	102
anes	4	48	.42	.45	.48	.52	99	109	117	125
ance	4	60	.42	.45	.48	.52	117	129	138	147
asti	4	72	.42	.45	.48	.52	135	149	159	170
aca	6	6	.44	.48	.51	.55	55	61	62	63
ame	6	12	.44	.48	.51	.55	69	76	79	81
aiizo	6	18	.44	.48	.51	.55	83	92	95	99
aras	6	24	.44	.48	.51	.55	96	107	111	116
ator	6	30	.44	.48	.51	.55	110	123	128	134
anha	6	36	.44	.48	.51	.55	124	138	144	151
avei	6	48	.44	.48	.51	.55	152	169	177	187
anis	6	60	.44	48	.51	.55	181	200	209	222
arca	6	72	.44	.48	.51	.55	208	231	242	257
amus	8	6	.46	.51	.56	.60	80	83	95	97
atum	8	12	.46	.51	.56	.60	99	104	119	123
acho	8	18	.46	.51	.56	.60	118	126	143	149
arii	8	24	.46	.51	.56	.60	138	147	167	174
atur	8	30	.46	.51	.56	.60	157	168	191	200
amos	8	36	.46	.51	.56	.60	176	190	215	225
abor	8	48	.46	.51	.56	.60	215	232	263	277
agno	8	60	.46	.51	.56	.60	253	274	311	328
bara	8	72	.46	.51	.56	.60	292	317	359	379
bero	10	6	.50	.57	.62	.68	108	114	125	131
bias	10	12	.50	.57	.62	.68	134	143	158	166
biam	10	18	.50	.57	.62	.68	160	173	191	202
begi	10	24	.50	.57	.62	.68	186	202	224	238
baik	10	30	.50	.57	.62	.68	212	232	256	274
beli	10	36	.50	.57	.62	.68	238	261	289	309
benk	10	48	.50	.57	.62	.68	290	320	354	381
berd	10	60	.50	.57	.62	.68	342	379	420	452
bini	10	72	.50	.57	.62	.68	394	437	485	523
bio	12	6	.54	.62	.68	.75	140	150	170	178
brom	12	12	.54	.62	.68	.75	174	188	213	224
bucu	12	18	.54	.62	.68	.75	207	226	255	271
brii	12	24	.54	.62	.68	.75	241	264	298	318
buis	12	30	.54	.62	.68	.75	274	302	341	365
enta	12	36	.54	.62	.68	.75	308	341	383	412
ebe	12	48	.54	.62	.68	.75	375	417	469	505
eaba	12	60	.54	.62	.68	.75	442	493	554	599
emie	12	72	.54	.62	.68	.75	509	570	640	691
eces	14	6	.57	.66	.74	.82	170	182	200	210
emur	14	12	.57	.66	.74	.82	212	230	254	270
emo	14	18	.57	.66	.74	.82	253	277	308	329
ebat	14	24	.57	.66	.74	.82	294	324	362	389
eor	14	30	.57	.66	.74	.82	335	372	416	449
enni	14	36	.57	.66	.74	.82	376	419	470	508
eria	14	48	.57	.66	.74	.82	468	514	578	627
erez	14	60	.57	.66	.74	.82	540	608	686	747
eret	14	72	.57	.66	.74	.82	622	703	794	866
eras	16	6	.60	.70	.80	.89	216	232	259	272
eunt	16	12	.60	.70	.80	.89	265	289	325	346
ete	16	18	.60	.70	.80	.89	315	346	392	419
esse	16	24	.60	.70	.80	.89	364	403	458	493
es	16	30	.60	.70	.80	.89	414	461	525	567
ero	16	36	.60	.70	.80	.89	463	518	592	641
ere	16	48	.60	.70	.80	.89	562	633	725	788
evio	16	60	.60	.70	.80	.89	661	747	858	935
evet	16	72	.60	.70	.80	.89	758	862	991	1083
evon	18	6	.64	.75	.87	.96	248	266	301	315
evi	18	12	.64	.75	.87	.96	307	335	382	404
evez	18	18	.64	.75	.87	.96	366	404	463	494
evas	18	24	.64	.75	.87	.96	425	473	544	583
eva	18	30	.64	.75	.87	.96	485	542	626	672
erve	18	36	.64	.75	.87	.96	544	610	707	761
erst	18	48	.64	.75	.87	.96	662	748	869	940
erre	18	60	.64	.75	.87	.96	780	886	1032	1118
eper	18	72	.64	.75	.87	.96	898	1024	1194	1296
eppe	20	6	.67	.80	.92	1.03	294	318	368	388
enno	20	12	.67	.80	.92	1.03	363	400	463	494
esen	20	18	.67	.80	.92	1.03	431	481	558	600
emen	20	24	.67	.80	.92	1.03	500	563	654	706
evve	20	30	.67	.80	.92	1.03	569	644	749	812
ions	20	36	.67	.80	.92	1.03	637	726	844	919
ione	20	48	.67	.80	.92	1.03	775	889	1035	1131
inna	20	60	.67	.80	.92	1.03	912	1052	1226	1343
inom	20	72	.67	.80	.92	1.03	1049	1215	1416	1555
iez	24	6	.76	.89	1.04	1.16	389	418	497	523
idas	24	12	.76	.89	1.04	1.16	482	526	625	669
icai	24	18	.76	.89	1.04	1.16	575	635	754	809
iam	24	24	.76	.89	1.04	1.16	668	744	883	952
ipse	24	30	.76	.89	1.04	1.16	762	853	1012	1095
ivor	24	36	.76	.89	1.04	1.16	855	971	1141	1238
iven	24	48	.76	.89	1.04	1.16	1042	1178	1398	1524
ivit	24	60	.76	.89	1.04	1.16	1228	1396	1656	1810
ives	24	72	.76	.89	1.04	1.16	1415	1613	1913	2096

See Table No. 43 for flange diameters, bolt circles, etc.
All weights are approximate.

P—52

Standard Flange and Spigot Pipe—Short Lengths

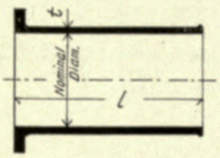


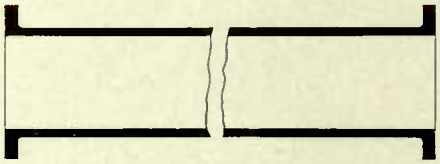
Table No. 46

Code Terminal	Nom'l Diam., Inches	Length l, Inches	Thickness, In. Class A	B	C	D	Weights, Pounds Class A Code Edot	B Efap	C Efes	D Efit	Code Terminal	Nom'l Diam., Inches	Length l, Inches	Thickness, In. Class A	B	C	D	Weights, Pounds Class A Code Edot	B Efap	C Efes	D Efit
acet	4	12	.42	.45	.48	.52	27	29	31	33	emur	14	12	.57	.66	.74	.82	124	142	158	174
ani	4	18	.42	.45	.48	52	36	39	42	45	emo	14	18	.57	.66	.74	.82	165	189	212	234
agus	4	24	.42	.45	.48	52	45	49	53	56	ebat	14	24	.57	.66	.74	.82	206	237	266	293
acti	4	30	.42	.45	.48	.52	54	59	63	67	eor	14	30	.57	.66	.74	.82	247	284	320	353
asis	4	36	.42	.45	.48	.52	63	69	74	79	enni	14	36	.57	.66	.74	.82	288	331	374	412
anes	4	48	.42	.45	.48	.52	81	89	95	102	eria	14	48	.57	.66	.74	.82	370	426	482	531
ance	4	60	.42	.45	.48	.52	99	109	117	124	erez	14	60	.57	.66	.74	.82	452	520	590	651
asti	4	72	.42	.45	.48	.52	117	129	138	147	eret	14	72	.57	.66	.74	.82	535	615	698	770
ame	6	12	.44	.48	.51	.55	40	43	46	48	eunt	16	12	.60	.70	.80	.89	151	175	197	218
alizo	6	18	.44	.48	.51	.55	54	59	62	66	ete	16	18	.60	.70	.80	.89	201	232	264	291
aras	6	24	.44	.48	.51	.55	67	74	78	83	esse	16	24	.60	.70	.80	.89	250	289	330	365
ator	6	30	.44	.48	.51	.55	81	90	95	101	es	16	30	.60	.70	.80	.89	300	347	397	439
anha	6	36	.44	.48	.51	.55	95	105	111	118	ero	16	36	.60	.70	.80	.89	349	404	464	512
avel	6	48	.44	.48	.51	.55	123	136	144	154	ere	16	48	.60	.70	.80	.89	448	519	597	660
anis	6	60	.44	.48	.51	.55	152	167	177	189	evio	16	60	.60	.70	.80	.89	547	633	730	807
arca	6	72	.44	.48	.51	.55	179	198	210	224	evet	16	72	.60	.70	.80	.89	644	747	863	955
atum	8	12	.46	.51	.56	.60	56	61	67	71	evi	18	12	.64	.75	.87	.96	173	200	229	252
acho	8	18	.46	.51	.56	.60	75	82	91	97	evez	18	18	.64	.75	.87	.96	232	269	311	341
aril	8	24	.46	.51	.56	.60	94	104	115	123	evas	18	24	.64	.75	.87	.96	291	338	392	430
atur	8	30	.46	.51	.56	.60	113	125	139	148	eva	18	30	.64	.75	.87	.96	350	407	473	519
amos	8	36	.46	.51	.56	.60	133	146	163	174	erve	18	36	.64	.75	.87	.96	409	476	554	609
abor	8	48	.46	.51	.56	.60	171	189	211	225	erst	18	48	.64	.75	.87	.96	527	614	717	787
agno	8	60	.46	.51	.56	.60	210	231	259	276	erre	18	60	.64	.75	.87	.96	646	752	879	965
bara	8	72	.46	.51	.56	.60	249	274	307	327	eper	18	72	.64	.75	.87	.96	764	889	1041	1144
bias	10	12	.50	.57	.62	.68	76	85	93	101	enno	20	12	.67	.80	.92	1.03	204	242	274	304
biam	10	18	.50	.57	.62	.68	102	115	125	137	esen	20	18	.67	.80	.92	1.03	273	323	369	411
begi	10	24	.50	.57	.62	.68	128	144	158	172	emen	20	24	.67	.80	.92	1.03	342	405	465	517
balk	10	30	.50	.57	.62	.68	154	174	191	208	evve	20	30	.67	.80	.92	1.03	410	486	560	623
bell	10	36	.50	.57	.62	.68	180	203	224	244	ions	20	36	.67	.80	.92	1.03	479	568	655	729
benk	10	48	.50	.57	.62	.68	232	262	289	315	ione	20	48	.67	.80	.92	1.03	616	731	846	942
berd	10	60	.50	.57	.62	.68	284	321	355	387	inna	20	60	.67	.80	.92	1.03	754	894	1036	1154
bini	10	72	.50	.57	.62	.68	336	379	420	458	inom	20	72	.67	.80	.92	1.03	891	1057	1227	1367
brom	12	12	.54	.62	.68	.75	103	117	127	139	idas	24	12	.76	.89	1.04	1.16	280	324	372	413
bucu	12	18	.54	.62	.68	.75	136	155	170	186	ical	24	18	.76	.89	1.04	1.16	373	433	501	556
bril	12	24	.54	.62	.68	.75	170	193	213	233	iam	24	24	.76	.89	1.04	1.16	466	542	630	699
buis	12	30	.54	.62	.68	.75	203	231	256	280	ipse	24	30	.76	.89	1.04	1.16	560	650	759	842
enta	12	36	.54	.62	.68	.75	237	270	298	326	icor	24	36	.76	.89	1.04	1.16	653	769	888	985
ebe	12	48	.54	.62	.68	.75	304	346	384	420	iven	24	48	.76	.89	1.04	1.16	840	976	1145	1271
eaba	12	60	.54	.62	.68	.75	371	422	469	514	ivit	24	60	.76	.89	1.04	1.16	1026	1194	1403	1557
emie	12	72	.54	.62	.68	.75	438	499	554	606	ives	24	72	.76	.89	1.04	1.16	1213	1411	1660	1843

See Table No. 43 for flange diameters, bolt circles, etc.
All weights are approximate.

P—52

Hydraulic Cylinders



Hydraulic Cylinders in lengths to 12 feet

For Bored Cylinders Code, **Efov** For Rough Cylinders Code, **Egas**

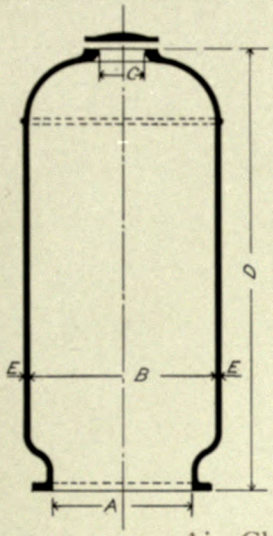
Each with flanges faced. Drilled to order only

Table No. 47

Code Terminal	Inside Diameter when Cast, Inches	Inside Diameter when Bored, Inches	t when Cast	t when Bored	Outside Diameter Inches	Diameter of Flange Inches	Thickness of Flange as Cast, Inches	Thickness of Flange when Finished, In.	Approximate Weight, Pounds, per				Where Cast
									Foot Cylinder as Cast	Foot Cylinder when Bored	Rough Flange	Finished Flange	
ame	11.50	12	.75	.50	13.00	17.00	1.50	1.25	90	61	37	31	A-L
aras	11.50	12	.81	.56	13.13	17.00	1.50	1.25	100	69	36	30	A-L
atore	11.50	12	.88	.63	13.25	17.00	1.50	1.25	106	77	35	29	A-L
anha	11.50	12	.94	.69	13.38	17.00	1.50	1.25	116	86	34	28	L
atico	11.50	12	1.00	.75	13.50	17.00	1.50	1.25	123	94	33	27	A-L
avel	11.50	12	1.13	.88	13.75	17.00	1.50	1.25	139	110	31	26	L
afft	11.50	12	1.25	1.00	14.00	17.00	1.50	1.25	156	127	28	24	L
anion	13.50	14	.75	.50	15.00	19.00	1.50	1.25	105	71	42	35	A
anis	13.50	14	.88	.63	15.25	19.00	1.50	1.25	123	90	39	32	L
arca	13.50	14	1.00	.75	15.50	19.00	1.50	1.25	142	108	37	30	A
aclie	13.50	14	1.13	.88	15.75	19.00	1.50	1.25	161	128	35	29	L
amus	13.50	14	1.25	1.00	16.00	19.00	1.50	1.25	181	147	32	27	L
atum	15.50	16	.75	.50	17.00	22.00	1.63	1.38	119	81	65	55	L
acho	15.50	16	.88	.63	17.25	22.00	1.63	1.38	140	101	62	52	L
aril	15.50	16	1.00	.75	17.50	22.00	1.63	1.38	162	123	59	49	A-L
abunt	15.50	16	1.13	.88	17.75	22.00	1.63	1.38	183	145	56	47	L
andum	15.50	16	1.25	1.00	18.00	22.00	1.63	1.38	205	167	53	45	L
atur	17.50	18	1.00	.75	19.50	24.00	1.63	1.38	181	138	65	55	L
avero	17.50	18	1.06	.81	19.63	24.00	1.63	1.38	193	150	64	54	L
arizo	17.50	18	1.13	.88	19.75	24.00	1.63	1.38	205	162	63	52	A
averi	17.50	18	1.25	1.00	20.00	24.00	1.63	1.38	230	186	61	49	A
arate	17.50	18	1.50	1.25	20.50	24.00	1.63	1.38	279	236	57	44	L
atorem	19.50	20	1.00	.75	21.50	26.00	1.63	1.38	201	153	71	60	A-L
anos	19.50	20	1.13	.88	21.75	26.00	1.63	1.38	227	179	67	56	A-L
abor	19.50	20	1.25	1.00	22.00	26.00	1.63	1.38	254	206	63	52	A-L
abaris	21.50	22	1.13	.88	23.75	28.00	1.63	1.38	249	196	73	61	A
acity	21.50	22	1.25	1.00	24.00	28.00	1.63	1.38	279	225	68	56	A-L
arage	23.50	24	1.00	.75	25.50	30.00	1.63	1.38	240	182	83	70	A
agno	23.50	24	1.13	.88	25.75	30.00	1.63	1.38	272	213	78	66	A-L
avate	23.50	24	1.25	1.00	26.00	30.00	1.63	1.38	303	245	73	62	A-L
acibus	23.50	24	1.38	1.13	26.25	30.00	1.63	1.38	335	277	67	57	A-L
alite	23.50	24	1.56	1.31	26.63	30.00	1.63	1.38	384	326	64	54	L
atima	25.50	26	1.25	1.00	28.00	32.50	1.75	1.50	328	265	97	83	L
andos	25.50	26	1.38	1.13	28.25	32.50	1.75	1.50	362	299	90	76	A
barla	26.50	27	1.25	1.00	29.00	33.50	1.75	1.50	340	274	101	86	A
barot	26.50	27	1.38	1.13	29.25	33.50	1.75	1.50	376	310	95	80	L
basan	27.50	28	1.25	1.00	30.00	34.50	2.00	1.75	352	284	119	104	L
basse	29.50	30	1.06	.81	31.63	36.50	2.00	1.75	318	245	136	119	A
bara	29.50	30	1.19	.94	31.88	36.50	2.00	1.75	357	284	132	115	L
beran	29.50	30	1.25	1.00	32.00	36.50	2.00	1.75	377	304	127	110	A-L
bevel	29.50	30	1.38	1.13	32.25	36.50	2.00	1.75	416	343	120	103	A-L
bero	29.50	30	1.50	1.25	32.50	36.50	2.00	1.75	453	383	113	99	L
blas	32.50	33	1.25	1.00	35.00	39.50	2.00	1.75	414	333	137	120	L
blam	35.50	36	1.25	1.00	38.00	44.50	2.00	1.75	450	363	219	192	L
blolan	35.50	36	1.38	1.13	38.25	44.50	2.00	1.75	497	409	208	182	L
blate	35.50	36	1.50	1.25	38.50	44.50	2.00	1.75	544	456	198	173	L
bione	35.50	36	1.75	1.50	39.00	44.50	2.00	1.75	639	551	188	164	L

These cylinders can be bored approximately ⅛ inch larger or smaller. We are prepared to make the flanges to suit requirements either as to diameter or thickness. Outside diameters cannot be changed, but a combination can be made by using a pattern with a smaller core than shown in table. In some cases these cylinders can be made as long as 15 feet.

All weights are approximate.



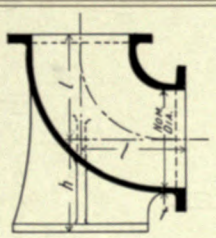
Standard Flanged Special Castings for Water

Air Chambers

TABLE No. 48. Code Word, **Eget**

Code Terminal	A	B	C	D	E	Approx. Weight Pounds
abor	24	36	10	90	1.15	3450
acity	24	36	10	90	1.58	4700
barot	30	42	10	99	1.28	4900
basan	30	42	10	99	1.78	6900
del	36	48	12	108	1.42	6850
deral	36	48	12	108	1.96	9600
deras	42	54	14	117	1.55	9250
dell	42	54	14	117	2.23	13500
engra	48	60	16	126	1.67	12000
ista	48	60	16	126	2.38	17000

P—106



4 to 24 inches

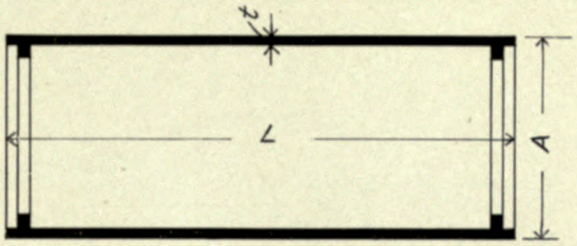
Standard Flanged 1/4 Curves with Foot

TABLE No. 50. Code Word, **Elat**

Code Terminal	Nom'l Diam. Inches	Class	l	t	h	Approx. Weight Pounds
ame	4	D	11	.52	5.50	86
atore	6	D	12	.55	6.50	113
avel	8	D	13	.60	7.50	178
arca	10	D	14	.68	9.00	270
aril	12	D	15	.75	10.00	380
anos	14	B	16	.66	12.00	435
abor	14	D	16	.82	12.00	517
basse	16	B	17	.70	13.00	565
bara	16	D	17	.89	13.00	677
belge	18	B	18	.75	14.00	694
balk	18	D	18	.96	14.00	812
bucu	20	B	19	.80	15.00	854
bonne	20	D	19	1.03	15.00	1005
deros	24	B	21	.89	17.50	1255
della	24	D	21	1.16	17.50	1490

P—64

See Table No. 43 for flange diameters, bolt circles, etc.



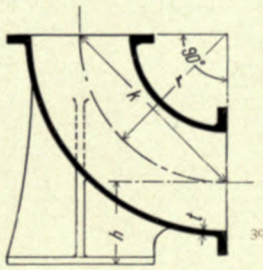
Cylinder Rolls

TABLE No. 49. Code Word, **Egiv**

Made in Lengths 8 to 12 Feet
Ends only are machined to square them

Code Terminal	A	t	Approx. Weight in Pounds L=8 Feet	Approx. Weight in Each Additional Foot
abaris	32.00	1.03	2694	313
abor	32.74	1.37	3645	421
beran	38.30	1.15	3614	419
bell	39.16	1.58	4997	582
bril	44.50	1.28	4668	542
bio	45.58	1.78	6552	764
dicort	50.80	1.42	5912	687
engra	51.98	1.96	8262	961
iculo	57.10	1.55	7269	844
ista	58.40	2.23	10532	1225
lien	63.40	1.67	8739	1013
tras	64.82	2.38	11455	1453

P—107



30 to 48 inches

Standard Flanged 1/4 Curves with Foot

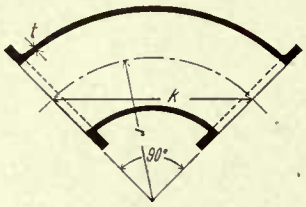
TABLE No. 51. Code Word, **Elav**

Code Terminal	Nom'l Diam. Inches	Class	t	r	k	h	Approx. Weight Pounds
etra	30	A	.88	36	50.90	21.00	1780
etros	30	B	1.03	36	50.90	21.00	2040
enbin	30	C	1.20	36	50.90	21.00	2325
engo	30	D	1.37	36	50.90	21.00	2605
egar	36	A	.99	48	67.90	24.50	3080
icell	36	B	1.15	48	67.90	24.50	3500
icet	36	C	1.36	48	67.90	24.50	4050
illus	36	D	1.58	48	67.90	24.50	4625
lapel	42	A	1.10	48	67.90	28.00	4120
larel	42	B	1.28	48	67.90	28.00	4670
laron	42	C	1.58	48	67.90	28.00	5470
latesi	42	D	1.78	48	67.90	28.00	6200
ocet	48	A	1.26	48	67.90	31.50	5430
omen	48	B	1.42	48	67.90	31.50	6000
ofer	48	C	1.71	48	67.90	31.50	7010
odis	48	D	1.96	48	67.90	31.50	7780

P—64 A

All weights are approximate.

Standard Flanged Special Castings for Water

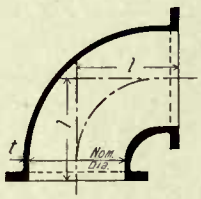


Standard Flanged 1/4 Curves

Table No. 52. Code Word, **Elib**

Code Terminal	Nom'l Diameter Inches	Class	t	r	k	Approx. Weight Pounds
ame	4	D	.52	16	22.60	69
atore	6	D	.55	16	22.60	101
avel	8	D	.60	16	22.60	147
arca	10	D	.68	16	22.60	209
aril	12	D	.75	16	22.60	287
anos	14	B	.66	18	25.50	315
abor	14	D	.82	18	25.50	387
basse	16	B	.70	24	34.00	470
bara	16	D	.89	24	34.00	604
belge	18	B	.75	24	34.00	558
balk	18	D	.96	24	34.00	707
bucu	20	B	.80	24	34.00	670
bonne	20	D	1.03	24	34.00	851
deros	24	B	.89	30	42.40	1067
della	24	D	1.16	30	42.40	1377
etra	30	A	.88	36	50.90	1546
etros	30	B	1.03	36	50.90	1799
enbin	30	C	1.20	36	50.90	2085
engo	30	D	1.37	36	50.90	2367
igar	36	A	.99	48	67.90	2682
icell	36	B	1.15	48	67.90	3103
icet	36	C	1.36	48	67.90	3653
illus	36	D	1.58	48	67.90	4226
lapel	42	A	1.10	48	67.90	3520
laret	42	B	1.28	48	67.90	4077
laron	42	C	1.54	48	67.90	4874
latesl	42	D	1.78	48	67.90	5602
ocet	48	A	1.26	48	67.90	4634
omen	48	B	1.42	48	67.90	5201
ofer	48	C	1.71	48	67.90	6216
odis	48	D	1.96	48	67.90	6982

P—65



Standard Flanged 1/4 Curve, Short Radius

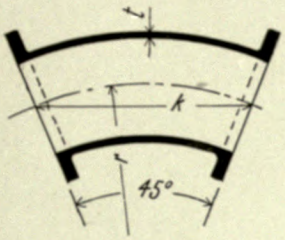
Table No. 53. Code Word, **Eloc**

Code Terminal	Nom'l Diameter Inches	Class	t	l	Approx. Weight Pounds
ame	4	D	.52	11	60
atore	6	D	.55	12	89
avel	8	D	.60	13	136
arca	10	D	.68	14	200
aril	12	D	.75	15	285
anos	14	B	.66	16	297
abor	14	D	.82	16	376
basse	16	B	.70	17	390
bara	16	D	.89	17	492
belge	18	B	.75	18	474
balk	18	D	.96	18	602
bucu	20	B	.80	19	589
bonne	20	D	1.03	19	747
deros	24	B	.89	21	851
della	24	D	1.16	21	1090

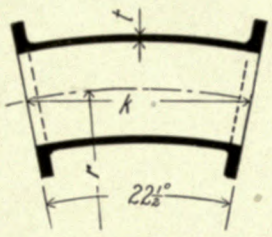
P—63

See Table No. 43 for flange diameters, bolt circles, etc.
All weights are approximate.

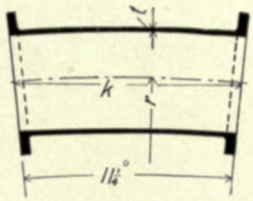
Standard Flanged Special Castings for Water



¼ Curve



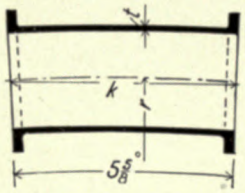
1/16 Curve



1/32 Curve

Standard Flanged Curves. TABLE No. 54

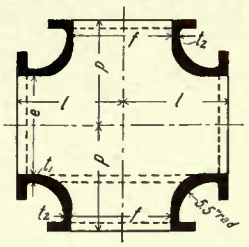
Nominal Diameter Inches	Class	t	¼ Curve. Code, **Emav**				1/16 Curve. Code, **Emeb**			1/32 Curve. Code, **Emic**			1/64 Curve. Code, **Emod**		
			Code Terminal	r	k	Approx. Weight Pounds	r	k	Approx. Weight Pounds	r	k	Approx. Weight Pounds	r	k	Approx. Weight Pounds
4	D	.52	**ame**	24	18.4	57	48	18.7	57						
6	D	.55	**atore**	24	18.4	83	48	18.7	83						
8	D	.60	**avel**	24	18.4	121	48	18.7	121						
10	D	.68	**arca**	24	18.4	170	48	18.7	170						
12	D	.75	**aril**	24	18.4	238	48	18.7	238						
14	B	.66	**anos**	36	27.6	341	72	28.1	341						
14	D	.82	**abor**	36	27.6	419	72	28.1	419						
16	B	.70	**basse**	36	27.6	418	72	28.1	418						
16	D	.89	**bara**	36	27.6	528	72	28.1	528						
18	B	.75	**belge**	36	27.6	484	72	28.1	484						
18	D	.96	**balk**	36	27.6	612	72	28.1	612						
20	B	.80	**bucu**	48	36.7	670	96	37.5	670	240	47.05	799	480	47.10	799
20	D	1.03	**bonne**	48	36.7	851	96	37.5	851	240	47.05	1019	480	47.10	1019
24	B	.89	**deros**	60	45.9	1066	120	46.8	1066	240	47.05	1070	480	47.10	1070
24	D	1.16	**della**	60	45.9	1377	120	46.8	1377	240	47.05	1376	480	47.10	1376
30	A	.88	**etra**	60	45.9	1337	120	46.8	1337	240	47.05	1314	480	47.10	1314
30	B	1.03	**etros**	60	45.9	1553	120	46.8	1553	240	47.05	1553	480	47.10	1553
30	C	1.20	**enbin**	60	45.9	1797	120	46.8	1797	240	47.05	1794	480	47.10	1794
30	D	1.37	**engo**	60	45.9	2036	120	46.8	2036	240	47.05	2029	480	47.10	2029
36	A	.99	**igar**	90	68.9	2542	180	70.2	2542	240	47.05	1834	480	47.10	1834
36	B	1.15	**icell**	90	68.9	3039	180	70.2	3039	240	47.05	2118	480	47.10	2118
36	C	1.36	**icet**	90	68.9	3459	180	70.2	3459	240	47.05	2485	480	47.10	2485
36	D	1.58	**illus**	90	68.9	3999	180	70.2	3999	240	47.05	2852	480	47.10	2852
42	A	1.10	**lapel**	90	68.9	3342	180	70.2	3342	240	47.05	2426	480	47.10	2426
42	B	1.28	**laret**	90	68.9	3871	180	70.2	3871	240	47.05	2821	480	47.10	2821
42	C	1.54	**laron**	90	68.9	4616	180	70.2	4616	240	47.05	3316	480	47.10	3316
42	D	1.78	**latesi**	90	68.9	5314	180	70.2	5314	240	47.05	3804	480	47.10	3804
48	A	1.26	**ocet**	90	68.9	4396	180	70.2	4396	240	47.05	3201	480	47.10	3201
48	B	1.42	**omen**	90	68.9	4935	180	70.2	4935	240	47.05	3565	480	47.10	3565
48	C	1.71	**ofer**	90	68.9	5897	180	70.2	5897	240	47.05	4247	480	47.10	4247
48	D	1.96	**odis**	90	68.9	7719	180	70.2	7719	240	47.05	4809	480	47.10	4809
54	A	1.35	**same**	90	68.9	5392	180	70.2	5392	240	47.05	3952	480	47.10	3952
54	B	1.55	**sand**	90	68.9	6082	180	70.2	6082	240	47.05	4442	480	47.10	4442
54	C	1.90	**sone**	90	68.9	7551	180	70.2	7551	240	47.05	5504	480	47.10	5504
54	D	2.23	**sica**	90	68.9	8749	180	70.2	8749	240	47.05	6332	480	47.10	6332
60	A	1.39	**ulode**	90	68.9	6488	180	70.2	6488	240	47.05	4854	480	47.10	4854
60	B	1.67	**ufre**	90	68.9	7671	180	70.2	7671	240	47.05	5690	480	47.10	5690
60	C	2.00	**ufon**	90	68.9	8965	180	70.2	8965	240	47.05	6691	480	47.10	6691
60	D	2.38	**udrey**	90	68.9	10646	180	70.2	10646	240	47.05	7778	480	47.10	7778



1/64 Curve

P—66-67

See Table No. 43 for flange diameters, bolt circles, etc.
All weights are approximate.



Standard Flanged Special Castings for Water

Standard Flanged Tees and Crosses

See Table No. 43 for Flange Diameters, Bolt Circles, Etc.

Sizes, 24 inches and larger, with Ribs, Bolts through Flats, Etc., as required

Table No. 55

Code Terminal	Nominal Diameter Inches e	Nominal Diameter Inches f	Class	l	p	Approximate Weight, Lbs. Tees Code Emuf	Approximate Weight, Lbs. Crosses Code Enab
ame	4	4	D	11.0	11.0	88	114
aras	6	4	D	12.0	12.0	124	150
atore	6	6	D	12.0	12.0	137	176
anha	8	4	D	13.0	13.0	166	192
atico	8	6	D	13.0	13.0	175	210
avel	8	8	D	13.0	13.0	195	250
afft	10	4	D	14.0	14.0	251	277
anion	10	6	D	14.0	14.0	269	303
anls	10	8	D	14.0	14.0	280	335
arca	10	10	D	14.0	14.0	300	355
aclie	12	4	D	15.0	15.0	351	377
amus	12	6	D	15.0	15.0	364	403
atum	12	8	D	15.0	15.0	380	435
acho	12	10	D	15.0	15.0	397	469
arli	12	12	D	15.0	15.0	426	528
abunt	14	4	B	16.0	16.0	374	400
andum	14	4	D	16.0	16.0	455	481
atur	14	6	B	16.0	16.0	387	426
avero	14	6	D	16.0	16.0	468	507
arizo	14	8	B	16.0	16.0	403	458
averi	14	8	D	16.0	16.0	484	539
arate	14	10	B	16.0	16.0	420	492
atorem	14	10	D	16.0	16.0	501	573
anos	14	12	B	16.0	16.0	449	551
abor	14	12	D	16.0	16.0	530	632
abaris	14	14	B	16.0	16.0	451	555
acity	14	14	D	16.0	16.0	557	681
arage	16	4	B	17.0	17.0	482	508
agno	16	4	D	17.0	17.0	582	608
avate	16	6	B	17.0	17.0	495	534
acibus	16	6	D	17.0	17.0	599	638
alite	16	8	B	17.0	17.0	511	566
atima	16	8	D	17.0	17.0	616	676
andos	16	10	B	17.0	17.0	528	600
barla	16	10	D	17.0	17.0	641	726
barot	16	12	B	17.0	17.0	557	659
basan	16	12	D	17.0	17.0	657	759
basse	16	14	B	17.0	17.0	559	663
bara	16	14	D	17.0	17.0	671	786
beran	16	16	B	17.0	17.0	589	722
bevel	16	16	D	17.0	17.0	716	876
bero	18	4	B	18.0	18.0	562	588
bias	18	4	D	18.0	18.0	708	734
blam	18	6	B	18.0	18.0	575	614
biolan	18	6	D	18.0	18.0	726	770
biate	18	8	B	18.0	18.0	591	646
bione	18	8	D	18.0	18.0	742	802
bonca	18	10	B	18.0	18.0	608	680
bolla	18	10	D	18.0	18.0	767	852
brona	18	12	B	18.0	18.0	637	739
begi	18	12	D	18.0	18.0	783	885
belag	18	14	B	18.0	18.0	643	751
belas	18	14	D	18.0	18.0	817	952
beige	18	16	B	18.0	18.0	686	836
balk	18	16	D	18.0	18.0	852	1022
bell	18	18	B	18.0	18.0	694	851
belon	18	18	D	18.0	18.0	873	1063
beure	20	6	B	19.0	19.0	713	752
berd	20	6	D	19.0	19.0	900	944
biene	20	8	B	19.0	19.0	729	784
bill	20	8	D	19.0	19.0	916	976
binal	20	10	B	19.0	19.0	746	818
bini	20	10	D	19.0	19.0	941	1026
bio	20	12	B	19.0	19.0	779	885
biros	20	12	D	19.0	19.0	991	1127
brito	20	14	B	19.0	19.0	789	899
brom	20	14	D	19.0	19.0	1026	1196
buron	20	16	B	19.0	19.0	824	974
boroi	20	16	D	19.0	19.0	1056	1256
bucu	20	18	B	19.0	19.0	838	995
bonne	20	18	D	19.0	19.0	1080	1303
brli	20	20	B	19.0	19.0	873	1072
bunt	20	20	D	19.0	19.0	1108	1360
back	24	6	B	21.0	21.0	1013	1052
biolus	24	6	D	21.0	21.0	1300	1344
buis	24	8	B	21.0	21.0	1029	1084
berto	24	8	D	21.0	21.0	1316	1376
borne	24	10	B	21.0	21.0	1046	1118
card	24	10	D	21.0	21.0	1341	1426
cana	24	12	B	21.0	21.0	1079	1185
cario	24	12	D	21.0	21.0	1391	1527
cape	24	14	B	21.0	21.0	1091	1209
cift	24	14	D	21.0	21.0	1426	1596
cire	24	16	B	21.0	21.0	1124	1274
dea	24	16	D	21.0	21.0	1454	1654
del	24	18	B	21.0	21.0	1135	1295
derai	24	18	D	21.0	21.0	1690	1963
deros	24	20	B	21.0	21.0	1173	1372
delia	24	20	D	21.0	21.0	1721	2028
dicort	24	24	B	21.0	21.0	1243	1512
digli	24	24	D	21.0	21.0	1820	2226
deur	30	12	A	19.5	24.0	1225	1321
dra	30	12	B	19.5	24.0	1420	1510
doit	30	12	C	19.5	24.0	1679	1720
dade	30	12	D	19.5	24.0	1800	1879
dangis	30	14	A	22.5	26.0	1405	1520
darb	30	14	B	22.5	26.0	1609	1724
dobs	30	14	C	22.5	26.0	1773	2013
dofen	30	14	D	22.5	26.0	2152	2372
dort	30	16	A	23.5	26.0	1502	1742
dalt	30	16	B	23.5	26.0	1726	1876
dean	30	16	C	23.5	26.0	2000	2171
dique	30	16	D	23.5	26.0	2305	2541
derlng	30	18	A	24.5	26.0	1555	1718
dellos	30	18	B	24.5	26.0	1794	1967
ebam	30	18	C	24.5	26.0	2055	2435

All weights are approximate.

P—70-72

Standard Flanged Special Castings for Water

Standard Flanged Tees and Crosses

See Table No. 43 for Flange Diameters, Bolt Circles, Etc.

Sizes, 24 inches and larger, with Ribs, Bolts through Flats, Etc., as required

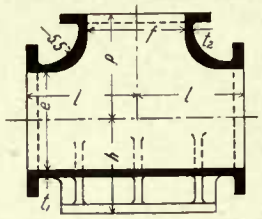
TABLE No. 55—Continued

Code Terminal	Nominal Diameter Inches e	Nominal Diameter Inches f	Class	l	p	Approximate Weight, Lbs. Tees Code **Emuf**	Approximate Weight, Lbs. Crosses Code **Enab**
entib	30	18	D	24.5	26.0	2386	2670
entis	30	20	A	25.5	26.0	1608	1792
eola	30	20	B	25.5	26.0	1856	2060
erem	30	20	C	25.5	26.0	2230	2568
etori	30	20	D	25.5	26.0	2489	2826
etra	30	24	A	27.5	26.0	1749	1986
etros	30	24	B	27.5	26.0	2013	2265
enbiu	30	24	C	27.5	26.0	2458	2880
engo	30	24	D	27.5	26.0	2735	3176
engra	30	30	A	30.5	30.5	1989	2328
erin	30	30	B	30.5	30.5	2349	2764
ernol	30	30	C	30.5	30.5	2854	3453
ernu	30	30	D	30.5	30.5	3263	3940
elazo	36	12	A	19.5	27.0	1678	1774
estro	36	12	B	19.5	27.0	1925	2028
esta	36	12	C	19.5	27.0	2241	2342
erata	36	12	D	19.5	27.0	2623	2784
erolla	36	14	A	22.5	29.0	1898	2025
ariate	36	14	B	22.5	29.0	2180	2318
erarla	36	14	C	22.5	29.0	2550	2710
escos	36	14	D	22.5	29.0	3035	3315
ebas	36	16	A	23.5	29.0	1980	2125
ently	36	16	B	23.5	29.0	2269	2424
fod	36	16	C	23.5	29.0	2670	2866
firn	36	16	D	23.5	29.0	3209	3565
form	36	18	A	24.5	29.0	2058	2227
falcon	36	18	B	24.5	29.0	2357	2530
faut	36	18	C	24.5	29.0	2770	2979
gabas	36	18	D	24.5	29.0	3304	3717
gamos	36	20	A	25.5	29.0	2147	2340
gareo	36	20	B	25.5	29.0	2458	2662
gesa	36	20	C	25.5	29.0	3059	3477
infer	36	20	D	25.5	29.0	3483	3919
igab	36	24	A	27.5	29.0	2328	2583
igadu	36	24	B	27.5	29.0	2660	2928
igam	36	24	C	27.5	29.0	3284	3782
igand	36	24	D	27.5	29.0	3755	4290
igar	36	30	A	30.5	33.5	2577	2911
icell	36	30	B	30.5	33.5	3112	3610
icet	36	30	C	30.5	33.5	3730	4405
illus	36	30	D	30.5	33.5	4301	5030
iculo	36	36	A	33.5	33.5	2864	3311
iaba	36	36	B	33.5	33.5	3511	4206
illa	36	36	C	33.5	33.5	4228	5134
itude	36	36	D	33.5	33.5	4908	5947
irem	42	12	A	20.0	30.0	2243	2335
icar	42	12	B	20.0	30.0	2573	2669
ieben	42	12	C	20.0	30.0	3037	3141
itio	42	12	D	20.0	30.0	3450	3554
idous	42	14	A	23.0	32.0	2491	2598
igra	42	14	B	23.0	32.0	2869	2987
ilan	42	14	C	23.0	32.0	3406	3546
iferos	42	14	D	23.0	32.0	4085	4439
ibus	42	16	A	24.0	32.0	2591	2721
icant	42	16	B	24.0	32.0	2972	3102
idity	42	16	C	24.0	32.0	3541	3706
itivo	42	16	D	24.0	32.0	4207	4547

Code Terminal	Nominal Diameter Inches e	Nominal Diameter Inches f	Class	l	p	Approximate Weight, Lbs. Tees Code **Emuf**	Approximate Weight, Lbs. Crosses Code **Enab**
ista	42	18	A	25.0	32.0	2668	2804
idum	42	18	B	25.0	32.0	3073	3217
itant	42	18	C	25.0	32.0	3849	4212
ilage	42	18	D	25.0	32.0	4394	4803
icolea	42	20	A	26.0	32.0	2801	2986
iches	42	20	B	26.0	32.0	3206	3391
kem	42	20	C	26.0	32.0	4024	4454
kunger	42	20	D	26.0	32.0	4591	5069
linos	42	24	A	28.0	32.0	3021	3271
linw	42	24	B	28.0	32.0	3450	3700
lock	42	24	C	28.0	32.0	4340	4875
lack	42	24	D	28.0	32.0	4954	5541
lard	42	30	A	31.0	36.5	3368	3734
lake	42	30	B	31.0	36.5	3868	4261
lamie	42	30	C	31.0	36.5	4941	5749
lante	42	30	D	31.0	36.5	5675	6601
lapel	42	36	A	34.0	36.5	3725	4214
laret	42	36	B	34.0	36.5	4295	4846
laron	42	36	C	34.0	36.5	5493	6520
latesi	42	36	D	34.0	36.5	6348	7469
leaba	42	42	A	37.0	37.0	4083	4736
leam	42	42	B	37.0	37.0	5023	6046
lieu	42	42	C	37.0	37.0	6114	7430
leat	42	42	D	37.0	37.0	7073	8608
nary	48	16	A	24.0	35.0	3365	3520
nois	48	16	B	24.0	35.0	3773	3908
nuse	48	16	C	24.0	35.0	4668	5008
nade	48	16	D	24.0	35.0	5293	5688
nion	48	18	A	25.0	35.0	3488	3632
neil	48	18	B	25.0	35.0	3860	4034
nera	48	18	C	25.0	35.0	4830	5204
onbius	48	18	D	25.0	35.0	5492	5926
ostet	48	20	A	26.0	35.0	3640	3932
ovia	48	20	B	26.0	35.0	3956	4218
opiro	48	20	C	26.0	35.0	5085	5576
oten	48	20	D	26.0	35.0	5762	6312
orgen	48	24	A	28.0	35.0	3916	4186
oque	48	24	B	28.0	35.0	4329	4599
olare	48	24	C	28.0	35.0	5449	6024
onnie	48	24	D	28.0	35.0	6153	6818
orios	48	30	A	31.0	39.5	4379	4762
ollos	48	30	B	31.0	39.5	5084	5737
orium	48	30	C	31.0	39.5	6110	6925
occia	48	30	D	31.0	39.5	6929	7845
oltoe	48	36	A	34.0	39.5	4822	5398
ocol	48	36	B	34.0	39.5	5642	6508
onet	48	36	C	34.0	39.5	6839	7990
obes	48	36	D	34.0	39.5	7755	9005
ocet	48	42	A	37.0	40.0	5244	5930
omen	48	42	B	37.0	40.0	6161	7197
ofer	48	42	C	37.0	40.0	7428	8738
odis	48	42	D	37.0	40.0	8478	9988
tigab	48	48	A	40.0	40.0	5578	6364
toris	48	48	B	40.0	40.0	6683	7977
tras	48	48	C	40.0	40.0	8102	9701
trud	48	48	D*	40.0	40.0		

All weights are approximate. * Made in steel.

P—70-72



Standard Flanged Special Castings for Water

Standard Flanged Tees with Bases

See Table No. 43 for Flange Diameters, Bolt Circles, Etc.

TABLE No. 56. Code Word, **Enec**

Code Terminal	Nominal Diameter Inches e	f	Class	l	p	h	Approx. Weight Pounds
ame	4	4	D	11	11	5.50	108
aras	6	4	D	12	12	6.50	154
atore	6	6	D	12	12	6.50	167
anha	8	4	D	13	13	7.50	206
atico	8	6	D	13	13	7.50	215
avel	8	8	D	13	13	7.50	235
afft	10	4	D	14	14	9.00	311
anlon	10	6	D	14	14	9.00	329
anls	10	8	D	14	14	9.00	340
arca	10	10	D	14	14	9.00	360
aclle	12	4	D	15	15	10 0	430
amus	12	6	D	15	15	10.0	444
atum	12	8	D	15	15	10.0	460
acho	12	10	D	15	15	10.0	477
arll	12	12	D	15	15	10.0	506
abunt	14	4	B	16	16	12.0	500
andum	14	4	D	16	16	12.0	585
atur	14	6	B	16	16	12.0	517
avero	14	6	D	16	16	12.0	598
arizo	14	8	B	16	16	12.0	533
averi	14	8	D	16	16	12.0	614
arate	14	10	B	16	16	12.0	550
atorem	14	10	D	16	16	12.0	631
anos	14	12	B	16	16	12.0	579
abor	14	12	D	16	16	12.0	660
abaris	14	14	B	16	16	12.0	581
aclty	14	14	D	16	16	12.0	687
arage	16	4	B	17	17	13 0	642
agno	16	4	D	17	17	13 0	742
avate	16	6	B	17	17	13.0	655
aclbus	16	6	D	17	17	13.0	759
alite	16	8	B	17	17	13.0	671
atima	16	8	D	17	17	13.0	776
andos	16	10	B	17	17	13.0	688
barla	16	10	D	17	17	13.0	801
barot	16	12	B	17	17	13.0	717
basan	16	12	D	17	17	13.0	817
basse	16	14	B	17	17	13.0	719
bara	16	14	D	17	17	13.0	831
beran	16	16	B	17	17	13 0	749
bevel	16	16	D	17	17	13.0	876
bero	18	4	B	18	18	14.0	672
blas	18	4	D	18	18	14.0	908
blam	18	6	B	18	18	14.0	775
blolan	18	6	D	18	18	14.0	926
blate	18	8	B	18	18	14.0	791
blone	18	8	D	18	18	14.0	942
bonca	18	10	B	18	18	14.0	808
bolla	18	10	D	18	18	14.0	967
brona	18	12	B	18	18	14.0	837
begl	18	12	D	18	18	14.0	983
belag	18	14	B	18	18	14.0	843
belas	18	14	D	18	18	14.0	1017
belge	18	16	B	18	18	14.0	886
balk	18	16	D	18	18	14.0	1052
bell	18	18	B	18	18	14.0	894
belon	18	18	D	18	18	14.0	1073
beure	20	6	B	19	19	15.0	943
berd	20	6	D	19	19	15.0	1130
blene	20	8	B	19	19	15.0	959
bill	20	8	D	19.0	19.0	15.0	1146
binal	20	10	B	19.0	19.0	15.0	976
bini	20	10	D	19.0	19.0	15.0	1171
blo	20	12	B	19.0	19.0	15.0	1009
biros	20	12	D	19.0	19.0	15.0	1221
brito	20	14	B	19.0	19.0	15.0	1019
brom	20	14	D	19.0	19.0	15.0	1256
buron	20	16	B	19.0	19.0	15.0	1054
borol	20	16	D	19.0	19.0	15.0	1286
bucu	20	18	B	19.0	19.0	15.0	1068
bonne	20	18	D	19.0	19.0	15.0	1310
brll	20	20	B	19.0	19.0	15.0	1103
bunt	20	20	D	19.0	19.0	15.0	1338
back	24	6	B	21.0	21.0	17.5	1313
biolus	24	6	D	21.0	21.0	17.5	1600
buls	24	8	B	21.0	21.0	17.5	1329
berto	24	8	D	21.0	21.0	17.5	1616
boine	24	10	B	21.0	21.0	17.5	1346
card	24	10	D	21.0	21.0	17.5	1641
cana	24	12	B	21.0	21.0	17.5	1379
carlo	24	12	D	21.0	21.0	17.5	1691
cape	24	14	B	21.0	21.0	17.5	1391
clft	24	14	D	21.0	21.0	17.5	1726
cire	24	16	B	21.0	21.0	17.5	1424
dea	24	16	D	21.0	21.0	17.5	1754
del	24	18	B	21.0	21.0	17.5	1435
deral	24	18	D	21.0	21.0	17.5	1940
deros	24	20	B	21.0	21.0	17.5	1473
della	24	20	D	21.0	21.0	17.5	1975
dicort	24	24	B	21.0	21.0	17.5	1543
digil	24	24	D	21.0	21.0	17.5	2070
deur	30	12	A	19.5	24.0	21.0	1385
dra	30	12	B	19.5	24.0	21.0	1580
dolt	30	12	C	19.5	24.0	21.0	1839
dade	30	12	D	19.5	24.0	21.0	1960
dangis	30	14	A	22.5	26.0	21.0	1565
darb	30	14	B	22.5	26.0	21.0	1770
dobs	30	14	C	22.5	26.0	21.0	1935
dofen	30	14	D	22.5	26.0	21.0	2315
dort	30	16	A	23.5	26.0	21.0	1660
dalt	30	16	B	23.5	26.0	21.0	1885
dean	30	16	C	23.5	26.0	21.0	2160
dique	30	16	D	23.5	26.0	21.0	2465
dering	30	18	A	24.5	26.0	21.0	1735
dellos	30	18	B	24.5	26.0	21.0	1975
ebam	30	18	C	24.5	26.0	21.0	2235
entib	30	18	D	24.5	26.0	21.0	2565
entis	30	20	A	25.5	26.0	21.0	1790
eola	30	20	B	25.5	26.0	21.0	2035
erem	30	20	C	25.5	26.0	21.0	2410
etori	30	20	D	25.5	26.0	21.0	2670
etra	30	24	A	27.5	26.0	21.0	1990
etros	30	24	B	27.5	26.0	21.0	2250
enblu	30	24	C	27.5	26.0	21.0	2700
engo	30	24	D	27.5	26.0	21.0	2975
engra	30	30	A	30.5	30.5	21.0	2230
erin	30	30	B	30.5	30.5	21.0	2590
ernol	30	30	C	30.5	30.5	21.0	3090
ernu	30	30	D	30.5	30.5	21.0	3510
elazo	36	12	A	19.5	27.0	24.5	1860

All weights are approximate.

P—71-72 A

Standard Flanged Special Castings for Water

Standard Flanged Tees with Bases

See Table No. 43 for Flange Diameters, Bolt Circles, Etc.

TABLE No. 56—Continued. Code Word, **Enec**

Code Terminal	Nominal Diameter Inches e	Nominal Diameter Inches f	Class	l	p	h	Approx. Weight Pounds
estro	36	12	B	19.5	27.0	24.5	2005
esta	36	12	C	19.5	27.0	24.5	2420
erata	36	12	D	19.5	27.0	24.5	2805
erolla	36	14	A	22.5	29.0	24.5	2080
eriate	36	14	B	22.5	29.0	24.5	2360
erarla	36	14	C	22.5	29.0	24.5	2730
escos	36	14	D	22.5	29.0	24.5	3215
ebas	36	16	A	23.5	29.0	24.5	2160
ently	36	16	B	23.5	29.0	24.5	2450
fod	36	16	C	23.5	29.0	24.5	2850
firn	36	16	D	23.5	29.0	24.5	3440
form	36	18	A	24.5	29.0	24.5	2290
falcon	36	18	B	24.5	29.0	24.5	2590
faut	36	18	C	24.5	29.0	24.5	3000
gabas	36	18	D	24.5	29.0	24.5	3530
gamos	36	20	A	25.5	29.0	24.5	2375
gareo	36	20	B	25.5	29.0	24.5	2690
gesa	36	20	C	25.5	29.0	24.5	3290
infer	36	20	D	25.5	29.0	24.5	3715
igab	36	24	A	27.5	29.0	24.5	2670
igadu	36	24	B	27.5	29.0	24.5	3000
igam	36	24	C	27.5	29.0	24.5	3625
igand	36	24	D	27.5	29.0	24.5	4095
igar	36	30	A	30.5	33.5	24.5	2915
icell	36	30	B	30.5	33.5	24.5	3450
icet	36	30	C	30.5	33.5	24.5	4070
illus	36	30	D	30.5	33.5	24.5	4640
iculo	36	36	A	33.5	33.5	24.5	3265
ioba	36	36	B	33.5	33.5	24.5	3910
illa	36	36	C	33.5	33.5	24.5	4630
itude	36	36	D	33.5	33.5	24.5	5310
irem	42	12	A	20.0	30.0	28.0	2480
icar	42	12	B	20.0	30.0	28.0	2800
ieben	42	12	C	20.0	30.0	28.0	3270
itio	42	12	D	20.0	30.0	28.0	3790
idous	42	14	A	23.0	32.0	28.0	2720
igra	42	14	B	23.0	32.0	28.0	3100
ilan	42	14	C	23.0	32.0	28.0	3630
iferos	42	14	D	23.0	32.0	28.0	4315
ibus	42	16	A	24.0	32.0	28.0	2820
icant	42	16	B	24.0	32.0	28.0	3205
idity	42	16	C	24.0	32.0	28.0	3770
itivo	42	16	D	24.0	32.0	28.0	4441
ista	42	18	A	25.0	32.0	28.0	2900
idum	42	18	B	25.0	32.0	28.0	3350
itant	42	18	C	25.0	32.0	28.0	4130
ilage	42	18	D	25.0	32.0	28.0	4675
icolea	42	20	A	26.0	32.0	28.0	3080
iches	42	20	B	26.0	32.0	28.0	3485
kem	42	20	C	26.0	32.0	28.0	4305
kunger	42	20	D	26.0	32.0	28.0	4870
linos	42	24	A	28.0	32.0	28.0	3300
linw	42	24	B	28.0	32.0	28.0	3850
lock	42	24	C	28.0	32.0	28.0	4740
lack	42	24	D	28.0	32.0	28.0	5355
lard	42	30	A	31.0	36.5	28.0	3770
lake	42	30	B	31.0	36.5	28.0	4270
lamie	42	30	C	31.0	36.5	28.0	5340
lante	42	30	D	31.0	36.5	28.0	6075
lapel	42	36	A	34.0	36.5	28.0	4225
laret	42	36	B	34.0	36.5	28.0	4795
larom	42	36	C	34.0	36.5	28.0	5995
latesi	42	36	D	34.0	36.5	28.0	6850
leaba	42	42	A	37.0	37.0	28.0	4685
leam	42	42	B	37.0	37.0	28.0	5625
lien	42	42	C	37.0	37.0	28.0	6715
leat	42	42	D	37.0	37.0	28.0	7675
nary	48	16	A	24.0	35.0	31.5	3795
nois	48	16	B	24.0	35.0	31.5	4205
nuse	48	16	C	24.0	35.0	31.5	5100
nade	48	16	D	24.0	35.0	31.5	5725
nion	48	18	A	25.0	35.0	31.5	3920
neil	48	18	B	25.0	35.0	31.5	4290
nera	48	18	C	25.0	35.0	31.5	5260
onbius	48	18	D	25.0	35.0	31.5	5920
ostet	48	20	A	26.0	35.0	31.5	4070
ovia	48	20	B	26.0	35.0	31.5	4385
opiro	48	20	C	26.0	35.0	31.5	5515
oten	48	20	D	26.0	35.0	31.5	6190
orgen	48	24	A	28.0	35.0	31.5	4465
oque	48	24	B	28.0	35.0	31.5	4880
olare	48	24	C	28.0	35.0	31.5	6000
onnie	48	24	D	28.0	35.0	31.5	6700
orios	48	30	A	31.0	39.5	31.5	4930
ollos	48	30	B	31.0	39.5	31.5	5630
orium	48	30	C	31.0	39.5	31.5	6660
occia	48	30	D	31.0	39.5	31.5	7480
oltoe	48	36	A	34.0	39.5	31.5	5370
ocol	48	36	B	34.0	39.5	31.5	6190
onet	48	36	C	34.0	39.5	31.5	7390
obes	48	36	D	34.0	39.5	31.5	8400
ocet	48	42	A	37.0	40.0	31.5	5995
omen	48	42	B	37.0	40.0	31.5	6910
ofer	48	42	C	37.0	40.0	31.5	8180
odis	48	42	D	37.0	40.0	31.5	9220
tigab	48	48	A	40.0	40.0	31.5	6420
toris	48	48	B	40.0	40.0	31.5	7530
tras	48	48	C	40.0	40.0	31.5	8950
trud	48	48	D*	40.0	40.0	31.5	

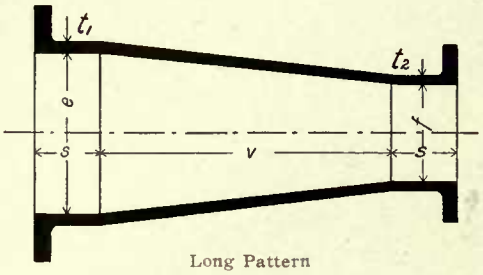
P—72 A

Large diameter tees and crosses with ribs, or with ribs and bolted through flats, or made in steel. See page 51.

* Made in steel.

All weights are approximate.

Standard Flanged Special Castings for Water

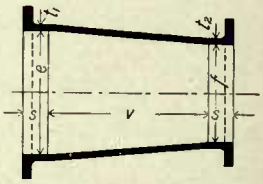


Long Pattern

Standard Flanged Reducers

4 to 24 inches

See Table No. 43 for Flange Diameters, Bolt Circles, Etc.



Short Pattern

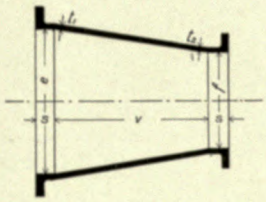
TABLE No. 57. Code, **Enid**

Code Terminal	Nominal Diameter Inches		Class	Thickness Inches		v	s	Approx. Weight Pounds	Code Terminal	Nominal Diameter Inches		Class	Thickness Inches		v	s	Approx. Weight Pounds
	e	f		t_1	t_2					e	f		t_1	t_2			
arent	6	4	D	.55	.52	18	4	88	beige	18	8	B	.75	.60	26	4	348
aca	6	4	D	.55	.52	12	2	67	baik	18	8	B	.75	.60	20	2	229
ame	8	4	D	.60	.52	18	4	111	bell	18	8	D	.96	.60	26	4	416
alizo	8	4	D	.60	.52	12	2	79	belon	18	8	D	.96	.60	20	2	249
aras	8	6	D	.60	.55	18	4	124	belrod	18	10	B	.75	.68	26	4	392
atore	8	6	D	.60	.55	12	2	91	benk	18	10	B	.75	.68	20	2	250
anha	10	4	D	.68	.52	18	4	142	beure	18	10	D	.96	.68	26	4	457
atico	10	4	D	.68	.52	12	2	103	berd	18	10	D	.96	.68	20	2	279
avel	10	6	D	.68	.55	18	4	160	biene	18	12	B	.75	.75	26	4	439
afft	10	6	D	.68	.55	12	2	115	bill	18	12	B	.75	.75	20	2	277
anlon	10	8	D	.68	.60	18	4	183	binai	18	12	D	.96	.75	26	4	506
anis	10	8	D	.68	.60	12	2	132	binl	18	12	D	.96	.75	20	2	305
area	12	4	D	.75	.52	18	4	183	bio	18	14	B	.75	.66	26	4	435
aciie	12	4	D	.75	.52	12	2	123	biros	18	14	B	.75	.66	20	2	307
amus	12	6	D	.75	.55	18	4	200	brito	18	14	D	.96	.82	26	4	548
atum	12	6	D	.75	.55	12	2	147	brom	18	14	D	.96	.82	20	2	364
acho	12	8	D	.75	.60	18	4	223	buron	18	16	B	.75	.70	26	4	481
arii	12	8	D	.75	.60	12	2	163	boroi	18	16	B	.75	.70	20	2	337
abunt	12	10	D	.75	.68	18	4	256	bucu	18	16	D	.96	.89	26	4	605
andum	12	10	D	.75	.68	12	2	187	bonne	18	16	D	.96	.89	20	2	403
atur	14	6	B	.66	.55	26	4	243	bril	20	10	B	.80	.68	32	4	503
avero	14	6	B	.66	.55	20	2	164	ebam	20	10	B	.80	.68	26	2	400
arizo	14	6	D	.82	.55	26	4	288	entib	20	10	D	1.03	.68	32	4	597
averl	14	6	D	.82	.55	20	2	184	entis	20	10	D	1.03	.68	26	2	479
arate	14	8	B	.66	.60	26	4	272	eoia	20	12	B	.80	.75	32	4	558
atorem	14	8	B	.66	.60	20	2	179	erem	20	12	B	.80	.75	26	2	446
anos	14	8	D	.82	.60	26	4	317	etori	20	12	D	1.03	.75	32	4	652
abor	14	8	D	.82	.60	20	2	202	etra	20	12	D	1.03	.75	26	2	523
abaris	14	10	B	.66	.68	26	4	313	etros	20	14	B	.80	.66	32	4	553
acity	14	10	B	.66	.68	20	2	200	enbin	20	14	B	.80	.66	26	2	453
arage	14	10	D	.82	.68	26	4	358	engo	20	14	D	1.03	.82	32	4	699
agno	14	10	D	.82	.68	20	2	224	engra	20	14	D	1.03	.82	26	2	558
arate	14	12	B	.66	.75	26	4	360	erin	20	16	B	.80	.70	32	4	602
acibus	14	12	B	.66	.75	20	2	227	ernol	20	16	B	.80	.70	26	2	487
aiite	14	12	D	.82	.75	26	4	407	ernu	20	16	D	1.03	.89	32	4	764
atima	14	12	D	.82	.75	20	2	245	erien	20	16	D	1.03	.89	26	2	614
andos	16	6	B	.70	.55	26	4	286	erish	20	18	B	.80	.75	32	4	641
baria	16	6	B	.70	.55	20	2	194	eone	20	18	B	.80	.75	26	2	517
barot	16	6	D	.89	.55	26	4	320	emaro	20	18	D	1.03	.96	32	4	812
basan	16	6	D	.89	.55	20	2	216	ezia	20	18	D	1.03	.96	26	2	657
basse	16	8	B	.70	.60	26	4	315	eolum	24	14	B	.89	.66	32	4	676
bara	16	8	B	.70	.60	20	2	209	emle	24	14	B	.89	.66	26	2	541
beran	16	8	D	.89	.60	26	4	375	effen	24	14	D	1.16	.82	32	4	1009
bevei	16	8	D	.89	.60	20	2	232	elazo	24	14	D	1.16	.82	26	2	853
bero	16	10	B	.70	.68	26	4	356	estro	24	16	B	.89	.70	32	4	725
bias	16	10	B	.70	.68	20	2	230	esta	24	16	B	.89	.70	26	2	580
biam	16	10	D	.89	.68	26	4	415	erata	24	16	D	1.16	.82	32	4	1075
biolan	16	10	D	.89	.68	20	2	252	eroila	24	16	D	1.16	.82	26	2	919
biate	16	12	B	.70	.75	26	4	405	eriate	24	18	B	.89	.75	32	4	764
bione	16	12	B	.70	.75	20	2	256	erarla	24	18	B	.89	.75	26	2	609
bonca	16	12	D	.89	.75	26	4	465	escos	24	18	D	1.16	.96	32	4	1123
bolla	16	12	D	.89	.75	20	2	279	ebas	24	18	D	1.16	.96	26	2	967
brona	16	14	B	.70	.66	26	4	402	entiy	24	20	B	.89	.80	32	4	824
begi	16	14	B	.70	.66	20	2	278	infer	24	20	B	.89	.80	26	2	659
beiag	16	14	D	.89	.82	26	4	506	ingab	24	20	D	1.16	1.03	32	4	1184
belas	16	14	D	.89	.82	20	2	317	igam	24	20	D	1.16	1.03	26	2	1044

All weights are approximate.

L—4987 P—68-73

Standard Flanged Special Castings for Water



Standard Flanged Reducers, 30 to 48 Inches

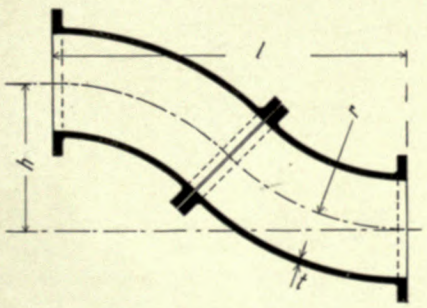
Table No. 57—Continued

Code Terminal	Nominal Diameter Inches		Thickness, Inches								v	s	Weights, Pounds			
			Class A		Class B		Class C		Class D				Class A	Class B	Class C	Class D
	e	f	t_1	t_2	t_1	t_2	t_1	t_2	t_1	t_2			Code **Enof**	Code **Enug**	Code **Epac**	Code **Eped**
dering	30	18	.88	.75	1.03	.75	1.20	.96	1.37	.96	26	4	780	863	1019	1111
dellos	30	18	.88	.75	1.03	.75	1.20	.96	1.37	.96	66	4	1462	1612	1925	2113
entis	30	20	.88	.80	1.03	.80	1.20	1.03	1.37	1.03	26	4	834	908	1090	1179
eola	30	20	.88	.80	1.03	.80	1.20	1.03	1.37	1.03	66	4	1548	1690	2053	2237
etra	30	24	.88	.89	1.03	.89	1.20	1.16	1.37	1.16	26	4	936	1021	1232	1310
etros	30	24	.88	.89	1.03	.89	1.20	1.16	1.37	1.16	66	4	1746	1906	2322	2503
erolla	36	20	.99	.80	1.15	.80	1.36	1.03	1.58	1.03	32	4	1162	1283	1540	1703
eriate	36	20	.99	.80	1.15	.80	1.36	1.03	1.58	1.03	66	4	1897	2099	2546	2827
eces	36	24	.99	.89	1.15	.89	1.36	1.16	1.58	1.16	32	4	1281	1403	1699	1867
emur	36	24	.99	.89	1.15	.89	1.36	1.16	1.58	1.16	66	4	2096	2305	2807	3102
eret	36	30	.99	.88	1.15	1.03	1.36	1.20	1.58	1.37	32	4	1401	1617	1885	2016
eras	36	30	.99	.88	1.15	1.03	1.36	1.20	1.58	1.37	66	4	2286	2651	3112	3576
exre	42	20	1.10	.80	1.28	.80	1.54	1.03	1.78	1.03	32	4	1427	1590	1915	2120
emen	42	20	1.10	.80	1.28	.80	1.54	1.03	1.78	1.03	66	4	2319	2585	3150	3505
erve	42	24	1.10	.89	1.28	.89	1.54	1.16	1.78	1.16	32	4	1547	1734	2074	2279
era	42	24	1.10	.89	1.28	.89	1.54	1.16	1.78	1.16	66	4	2515	2836	3414	3779
infer	42	30	1.10	.88	1.28	1.03	1.54	1.20	1.78	1.37	32	4	1666	1992	2257	2568
igar	42	30	1.10	.88	1.28	1.03	1.54	1.20	1.78	1.37	66	4	2801	3134	3712	4250
illus	42	36	1.10	.99	1.28	1.15	1.54	1.36	1.78	1.58	32	4	1885	2173	2562	2932
icullo	42	36	1.10	.99	1.28	1.15	1.54	1.36	1.78	1.58	66	4	3052	3533	4202	4837
idons	48	30	1.26	.88	1.42	1.03	1.71	1.20	1.96	1.37	32	4	2014	2274	2675	2982
igra	48	30	1.26	.88	1.42	1.03	1.71	1.20	1.96	1.37	66	4	3246	3689	4371	4975
ilam	48	30	1.26	.88	1.42	1.03	1.71	1.20	1.96	1.37	132	4	5653	6439	7670	8776
ista	48	36	1.26	.99	1.42	1.15	1.71	1.36	1.96	1.58	32	4	2235	2423	2976	3409
idum	48	36	1.26	.99	1.42	1.15	1.71	1.36	1.96	1.58	66	4	3605	4090	4861	5574
itant	48	36	1.26	.99	1.42	1.15	1.71	1.36	1.96	1.58	132	4	6258	7131	8516	9816
iras	48	42	1.26	1.10	1.42	1.28	1.71	1.54	1.96	1.78	32	4	2497	2729	3348	3801
ipse	48	42	1.26	1.10	1.42	1.28	1.71	1.54	1.96	1.78	66	4	3747	4264	5088	5811
ivos	48	42	1.26	1.10	1.42	1.28	1.71	1.54	1.96	1.78	132	4	6963	7954	9558	10981

P—74

Standard Flanged Off-sets

Table No. 58. Code Word, **Epif**



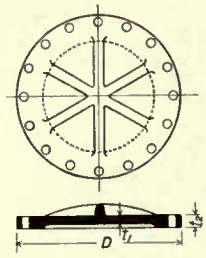
Standard Flanged Off-sets
Made up with standard flanged ⅛ curves

Code Terminal	Nom'l Diam. Inches	Class	t	r	h	l	Approx. Weight Inches
ame	4	D	.52	24	14	33.90	113
atore	6	D	.55	24	14	33.90	166
avel	8	D	.60	24	14	33.90	241
arca	10	D	.68	24	14	33.90	341
aril	12	D	.75	24	14	33.90	477
anos	14	B	.66	36	21	50.90	683
abor	14	D	.82	36	21	50.90	839
basse	16	B	.70	36	21	50.90	838
bara	16	D	.89	36	21	50.90	1050
belge	18	B	.75	36	21	50.90	968
balk	18	D	.96	36	21	50.90	1223
bucu	20	B	.80	48	28	67.90	1340
bonne	20	D	1.03	48	28	67.90	1703
deros	24	B	.89	60	35	84.80	2134
della	24	D	1.16	60	35	84.80	2754

See Table No. 43 for flange diameters, bolt circles, etc.
All weights are approximate.

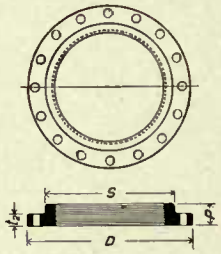
P—69

Blank Flanges



For use with Standard Water Pipe
Classes A, B, C, D

Screw Flanges



Blank Flanges 3-14 inches, no Ribs; 16-30 inches, 3 Ribs; 36-48 inches, 4 Ribs.

Table No. 59. Code, **Epog**

Code Terminal	Nominal Diam. Inches	Class	D	t_1	t_2	Approx. Weight Pounds
acet	3	D	7.50	.65	.85	9
andi	4	D	9.00	.65	.91	14
aca	6	D	11.00	.70	.96	23
amus	8	D	13.50	.75	1.03	36
bero	10	D	16.00	.80	1.15	55
bio	12	D	19.00	.85	1.26	84
eces	14	B	21.00	.85	1.12	94
emur	14	D	21.00	.90	1.36	108
eras	16	B	23.50	.90	1.18	127
eunt	16	D	23.50	1.00	1.47	151
evon	18	B	25.00	.95	1.26	150
evi	18	D	25.00	1.05	1.57	177
eppe	20	B	27.50	1.00	1.33	194
enno	20	D	27.50	1.15	1.68	234
iez	24	B	32.00	1.05	1.47	278
idas	24	D	32.00	1.25	1.87	341
icell	30	A	38.75	1.15	1.45	423
igar	30	B	38.75	1.15	1.68	452
illus	30	C	38.75	1.32	1.93	518
iculo	30	D	38.75	1.50	2.19	589
iila	36	A	45.75	1.25	1.62	647
itude	36	B	45.75	1.40	1.86	732
irem	36	C	45.75	1.60	2.17	844
itio	36	D	45.75	1.80	2.50	959
idous	42	A	52.75	1.40	1.78	955
kem	42	B	52.75	1.50	2.05	1053
kunger	42	C	52.75	1.75	2.44	1238
linos	42	D	52.75	1.95	2.80	1397
linu	48	A	59.50	1.50	2.02	1328
lock	48	B	59.50	1.65	2.26	1469
ioto	48	C	59.50	1.95	2.70	1745
iow	48	D	59.50	2.20	3.07	1975

All weights are approximate. L—5232

Table No. 60. Code, **Epal**

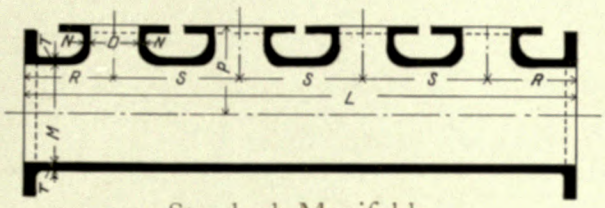
Code Terminal	Nominal Diam. Inches	Class	D	S	P	t_2	Approx. Weight Pounds
acet	3	D	7.50	4.38	1.50	.85	9
andi	4	D	9.00	5.50	1.63	.91	12
aca	6	D	11.00	7.63	1.75	.96	18
amus	8	D	13.50	9.75	2.00	1.03	27
bero	10	D	16.00	12.00	2.25	1.15	40
bio	12	D	19.00	14.13	2.38	1.26	60
eces	14	B	21.00	16.50	2.50	1.12	76
emur	14	D	21.00	16.50	2.50	1.36	84
eras	16	B	23.50	18.50	2.63	1.18	90
eunt	16	D	23.50	18.50	2.63	1.47	103
evon	18	B	25.00	20.50	2.75	1.26	107
evi	18	D	25.00	20.50	2.75	1.57	120
eppe	20	B	27.50	22.50	2.75	1.33	128
enno	20	D	27.50	22.50	2.75	1.68	145
iez	24	B	32.00	26.50	3.00	1.47	174
idas	24	D	32.00	26.50	3.00	1.87	189

L—5232

These flanges can be chased for smaller pipes than given above.

For drilling, etc., of blank flanges and screw flanges, see Table No. 43.

Standard Flanged Special Castings for Water



Standard Manifolds
Table No. 61. Code Word, **Esad**

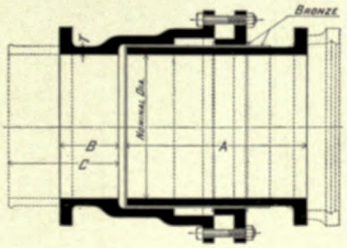
Code Terminal	Nom'l Diam. Inches M	Nom'l Diam. Inches O	T	N	R	S	P	L	No. of Outlets	Approx. Weight Pounds
atore	6	4	.55	.52	7.50	11.00	7	26.00	2	135
avel	8	4	.60	.52	7.50	11.00	8	48.00	4	304
ame	8	6	.60	.55	9.50	13.00	8	32.00	2	215
arca	10	4	.68	.52	7.50	11.00	9	70.00	6	560
basse	10	6	.68	.55	9.50	13.00	9	45.00	3	381
belge	10	8	.68	.60	11.50	15.50	9	38.50	2	337
aril	12	6	.75	.55	9.50	13.00	10	58.00	4	617
bucu	12	8	.75	.60	11.50	15.50	10	38.50	2	441

P—59

Standard Return Bends
Table No. 62. Code Word, **Esef**

Code Terminal	Nominal Diameter Inches	Class	T	L	L_2	Approx. Weight Pounds
ame	4	D	.52	5.50	11.00	65
atore	6	D	.55	6.50	13.00	104
avel	8	D	.60	7.75	15.50	167
arca	10	D	.68	9.00	18.00	260
aril	12	D	.75	10.50	21.00	394

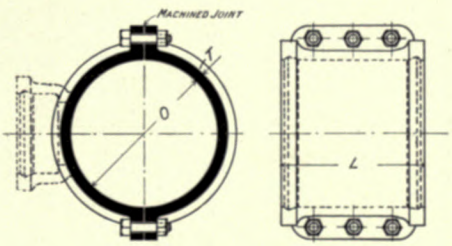
P—62



Standard Expansion Joint
Table No. 63

Code Terminal	Nominal Diam. Inches	Class	A	B	C	T	Weight Pounds Bell and Spigot Code **Esol**	Weight Pounds Flange Ends Code **Esum**
ame	4	D	16	5.00	10	.52	129	111
atore	6	D	16	5.00	10	.55	190	160
avel	8	D	18	5.00	10	.60	295	250
arca	10	D	18	5.00	10	.68	422	357
aril	12	D	18	6.00	12	.75	591	497
anos	14	D	20	6.00	12	.82	777	658
basse	16	D	20	6.00	12	.89	990	851
belge	18	D	22	7.50	12	.96	1180	1010
bucu	20	D	22	7.50	12	1.03	1430	1231
deras	24	D	22	7.50	12	1.16	1903	1654

P—40



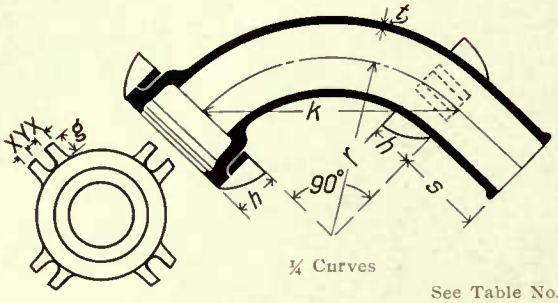
Standard Split Sleeves with and without Branch Outlet. Table No. 64

Code Terminal	Nominal Diam. Inches	Class	T	L	O	Diam. Branch Inches	Bolts Size	Bolts No.	Weight Pounds Without Branch Code **Eteg**	Weight Pounds With Branch Code **Etil**
ame	4	D	.65	10	5.70	..	.75	6	72	
atore	6	D	.70	10	7.80	4	.88	6	86	109
avel	8	D	.75	12	10.00	4	1.00	6	133	156
arca	10	D	.80	12	12.10	4	1.13	6	158	181
aril	12	D	.85	14	14.20	6	1.13	8	222	255
anos	14	B	.85	15	16.10	6	1.00	8	264	297
abor	14	D	.90	15	16.45	6	1.13	8	286	319
basse	16	B	.90	15	18.40	6	1.13	8	323	356
bara	16	D	1.00	15	18.80	6	1.13	8	359	392
belge	18	B	.95	15	20.50	6	1.13	8	373	406
balk	18	D	1.05	15	20.92	6	1.13	8	469	502
bucu	20	B	1.00	15	22.60	6	1.13	8	428	461
bonne	20	D	1.15	15	23.08	6	1.13	8	502	535
deros	24	B	1.05	15	26.80	6	1.13	8	535	568
della	24	D	1.25	15	27.32	6	1.25	8	652	685

L—5284

See Table No. 43 for flange diameters, bolt circles, etc.
All weights are approximate.

Standard Special Castings for High Pressure Service



¼ Curves ⅛ Curves $\frac{1}{16}$ Curves

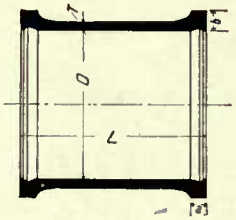
See Table No. 8 for Dimensions and Weights of Lugs

Standard Curves, Bell and Spigot, for High Pressure Service. TABLE No. 65

Nominal Diameter Inches	Class	t	¼ Curves. Code Word, **Etom** Code Term'l	r	k	s	Approx. Weight Pounds	⅛ Curves. Code Word, **Evag** Code Term'l	r	k	s	Approx. Weight Pounds	$\frac{1}{16}$ Curves. Code Word, **Evel** Code Term'l	r	k	Approx. Weight Pounds
6	F	.61	**atore**	16	22.60	8	153	**atore**	24	18.40	6	127				
6	H	.69	**anl**	16	22.60	8	178	**anl**	24	18.40	6	147				
8	F	.71	**avel**	16	22.60	10	237	**avel**	24	18.40	6	186				
8	H	.80	**actl**	16	22.60	10	273	**actl**	24	18.40	6	213				
10	F	.80	**arca**	16	22.60	12	353	**arca**	24	18.40	6	266				
10	H	.92	**ance**	16	22.60	12	409	**ance**	24	18.40	6	307				
12	F	.89	**arll**	16	22.60	12	466	**arll**	24	18.40	6	350				
12	H	1.04	**amus**	16	22.60	12	548	**amus**	24	18.40	6	410				
14	F	.99	**anos**	18	25.50	12	637	**anos**	36	27.60	6	563				
14	H	1.16	**abor**	18	25.50	12	746	**abor**	36	27.60	6	660				
16	F	1.08	**basse**	24	34.00	12	922	**basse**	36	27.60	6	690				
16	H	1.27	**bara**	24	34.00	12	1104	**bara**	36	27.60	6	827				
18	F	1.17	**belge**	24	34.00	12	1138	**belge**	36	27.60	6	854				
18	H	1.39	**balk**	24	34.00	12	1372	**balk**	36	27.60	6	1030				
20	F	1.27	**bucu**	24	34.00	12	1361	**bucu**	48	36.70	6	1228				
20	H	1.51	**bonne**	24	34.00	12	1626	**bonne**	48	36.70	6	1468				
24	F	1.45	**deros**	..	.....	..	....	**deros**	60	45.90	6	1978	**deros**	120	46.80	1797
30	E	1.55	**etra**	..	.....	..	....	**etra**	60	45.90	6	2634	**etra**	120	46.80	2394
30	F	1.73	**etros**	..	.....	..	....	**etros**	60	45.90	6	3038	**etros**	120	46.80	2686
36	E	1.80	**igar**	..	.....	..	....	**igar**	90	68.90		4633	**igar**	180	70.20	4633
36	F	2.02	**icell**	..	.....	..	....	**icell**	90	68.90		5255	**iceli**	180	70.20	5255

L—4857

Standard Sleeves for High Pressure Service. TABLE No. 66. Code Word, **Evin**



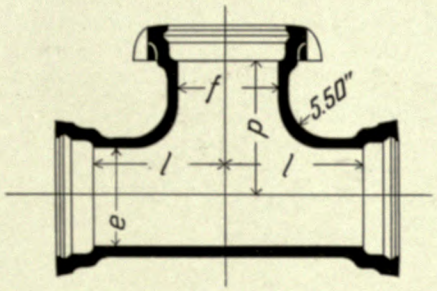
Standard Sleeves for High Pressure Service

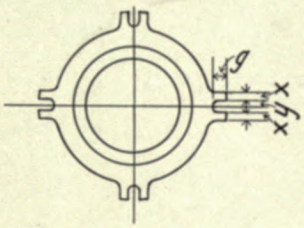
For dimensions a and b, see Table No. 3

Code Terminal	Nominal Diameter Inches	Class	D	L	T	Approx. Weight Pounds
atore	6	F	8.02	10	.75	81
acet	6	H	8.18	10	.85	93
avel	8	F	10.22	12	.85	126
anl	8	H	10.40	12	.95	141
arca	10	F	12.40	12	.95	171
agus	10	H	12.64	12	1.05	189
arie	12	F	14.58	14	1.05	239
asls	12	H	14.88	14	1.20	274
anos	14	F	16.88	15	1.15	324
abor	14	H	17.22	15	1.35	379
basse	16	F	19.06	15	1.25	393
bara	16	H	19.44	15	1.45	461
belge	18	F	21.24	15	1.40	491
balk	18	H	21.68	15	1.65	583
bucu	20	F	23.44	15	1.50	571
bonne	20	H	23.92	15	1.75	672
deros	24	F	28.00	15	1.70	764
etra	30	E	34.20	15	1.80	1023
etros	30	F	34.56	15	2.00	1139
igar	36	E	40.70	15	2.05	1389
icell	36	F	41.14	15	2.30	1560

All weights are approximate. L—4871

Standard Special Castings for High Pressure





x=1.25
y=1.63
g=2.50
6-12 in., 4 Lugs.
14-20 in., 6 Lugs.

Standard Branches for High Pressure. Table No. 67

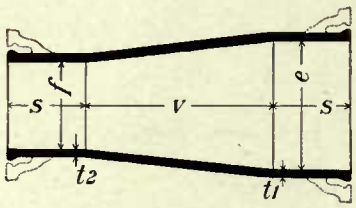
Code Terminal	Nominal Diameter Inches e	Nominal Diameter Inches f	Class	l	p	Approximate Weight Pounds 3-Way Code Evon	Approximate Weight Pounds 4-Way Code Evup
atore	6	6	F	12	12	247	317
ame	6	6	H	12	12	280	361
atico	8	6	F	13	13		
anha	8	6	H	13	13		
avel	8	8	F	13	13		
atico	8	8	H	13	13		
anion	10	6	F	14	14		
atore	10	6	H	14	14		
anis	10	8	F	14	14		
afft	10	8	H	14	14		
arca	10	10	F	14	14		
anion	10	10	H	14	14		
amus	12	6	F	15	15	Made only to order in steel	Made only to order in steel
aclie	12	6	H	15	15		
atum	12	8	F	15	15		
ance	12	8	H	15	15		
acho	12	10	F	15	15		
akor	12	10	H	15	15		
aril	12	12	F	15	15		
aca	12	12	H	15	15		
atur	14	6	F	16	16		
avero	14	6	H	16	16		
arizo	14	8	F	16	16		
averi	14	8	H	16	16		
arate	14	10	F	16	16		
atorem	14	10	H	16	16		
anos	14	12	F	16	16		
abor	14	12	H	16	16		
abaris	14	14	F	16	16		
acity	14	14	H	16	16		
avate	16	6	F	17	17		
acibus	16	6	H	17	17		
alite	16	8	F	17	17		
atima	16	8	H	17	17		
andos	16	10	F	17	17		
barla	16	10	H	17	17		

Code Terminal	Nominal Diameter Inches e	Nominal Diameter Inches f	Class	l	p	Approximate Weight Pounds 3-Way Code Evon	Approximate Weight Pounds 4-Way Code Evup
barot	16	12	F	17	17		
basan	16	12	H	17	17		
basse	16	14	F	17	17		
bara	16	14	H	17	17		
beran	16	16	F	17	17		
bevel	16	16	H	17	17		
biam	18	6	F	18	18		
biolan	18	6	H	18	18		
biate	18	8	F	18	18		
bione	18	8	H	18	18		
bonca	18	10	F	18	18		
bolla	18	10	H	18	18		
brona	18	12	F	18	18	Made only to order in steel	Made only to order in steel
begi	18	12	H	18	18		
belag	18	14	F	18	18		
belas	18	14	H	18	18		
belge	18	16	F	18	18		
balk	18	16	H	18	18		
bell	18	18	F	18	18		
belon	18	18	H	18	18		
beure	20	6	F	19	19		
berd	20	6	H	19	19		
biene	20	8	F	19	19		
bill	20	8	H	19	19		
binal	20	10	F	19	19		
bini	20	10	H	19	19		
bio	20	12	F	19	19		
biros	20	12	H	19	19		
brito	20	14	F	19	19		
brom	20	14	H	19	19		
buron	20	16	F	19	19		
boroi	20	16	H	19	19		
bucu	20	18	F	19	19		
bonne	20	18	H	19	19		
bril	20	20	F	19	19		
bunt	20	20	H	19	19		

L—4871

8 to 20 inches made to order only in steel. For other tees 12 to 36 inches, see Table No. 69. All weights are approximate.

Standard Special Castings for High Pressure Service



Standard Reducers and Increasers

Table No. 68

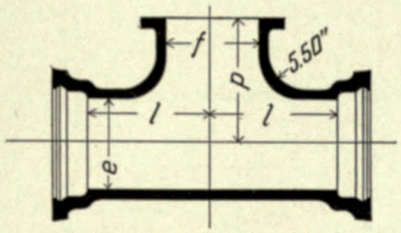
Code Terminal	Nominal Diameter Inches e	Nominal Diameter Inches f	Thickness Inches t_1	Thickness Inches t_2	Class	V	Weight, Pounds Spigot Ends Code Fab	Weight, Pounds Large End Bell Code Falt	Weight, Pounds Small End Bell Code Fels
atico	8	6	.71	.61	F	18	141	182	173
atore	8	6	.80	.69	H	18	165	210	199
anion	10	6	.80	.61	F	18	177	234	209
arll	10	6	.92	.69	H	18	208	270	242
anis	10	8	.80	.71	F	18	207	264	247
abor	10	8	.92	.80	H	18	240	303	286
amus	12	6	.89	.61	F	18	218	287	250
abaris	12	6	1.04	.69	H	18	238	336	292
atum	12	8	.89	.71	F	18	248	317	289
aca	12	8	1.04	.80	H	18	290	369	336
acho	12	10	.89	.80	F	18	284	353	341
alizo	12	10	1.04	.92	H	18	333	412	396
atur	14	6	.99	.61	F	20	281	366	313
avero	14	6	1.16	.69	H	20	328	433	362
arizo	14	8	.99	.71	F	20	313	398	353
averi	14	8	1.16	.80	H	20	362	467	408
arate	14	10	.99	.80	F	20	350	435	407
atorem	14	10	1.16	.92	H	20	408	513	470
anos	14	12	.99	.89	F	20	394	479	463
akor	14	12	1.16	1.04	H	20	461	566	539
avate	16	6	1.08	.61	F	20	331	436	363
acibus	16	6	1.27	.69	H	20	396	521	430
alite	16	8	1.08	.71	F	20	362	467	403
atima	16	8	1.27	.80	H	20	430	555	476
andos	16	10	1.08	.80	F	20	400	505	458
barla	16	10	1.27	.92	H	20	476	601	538
barot	16	12	1.08	.89	F	20	444	549	513
basan	16	12	1.27	1.04	H	20	529	654	607
basse	16	14	1.08	.99	F	20	494	599	579
bara	16	14	1.27	1.16	H	20	584	709	689
blate	18	8	1.17	.71	F	20	424	560	464
bionne	18	8	1.39	.80	H	20	506	671	551
banea	18	10	1.17	.80	F	20	462	598	518
bolia	18	10	1.39	.92	H	20	551	717	614
brona	18	12	1.17	.89	F	20	505	642	574
begi	18	12	1.39	1.04	H	20	604	770	683
belag	18	14	1.17	.99	F	20	556	692	640
belas	18	14	1.39	1.16	H	20	659	825	765
belge	18	16	1.17	1.08	F	20	605	742	710
balk	18	16	1.39	1.27	H	20	727	893	852
binal	20	10	1.27	.80	F	26	617	773	674
bini	20	10	1.51	.92	H	26	730	923	793
bio	20	12	1.27	.89	F	26	668	824	737
biros	20	12	1.51	1.04	H	26	792	985	870
brito	20	14	1.27	.99	F	26	727	882	812
brom	20	14	1.51	1.16	H	26	856	1050	962
buron	20	16	1.27	1.08	F	26	784	940	890
borol	20	16	1.51	1.27	H	26	935	1129	1061
bucu	20	18	1.27	1.17	F	26	856	1012	993
bonne	20	18	1.51	1.39	H	26	1024	1217	1189
cape	24	14	1.45	.99	F	26	895	1115	980
cire	24	16	1.45	1.08	F	26	953	1173	1058
del	24	18	1.45	1.17	F	26	1025	1244	1161
deros	24	20	1.45	1.27	F	26	1104	1324	1260
dering	30	18	1.55	1.17	E	26	1231	1536	1367
dellos	30	18	1.73	1.39	F	26	1337	1674	1473
entls	30	20	1.55	1.27	E	26	1310	1615	1465
eola	30	20	1.73	1.51	F	26	1416	1754	1572
etra	30	24	1.55	1.45	E	26	1479	1784	1698
etros	30	24	1.73	1.45	F	26	1584	1922	1804
erolla	36	20	1.80	1.27	E	32	1872	2290	2028
eriate	36	20	2.02	1.51	F	32	2048	2534	2203
eces	36	24	1.80	1.45	E	32	2065	2482	2285
emur	36	24	2.02	1.45	F	32	2240	2726	2460
eret	36	30	1.80	1.55	E	32	2300	2718	2605
eras	36	30	2.02	1.73	F	32	2596	3082	2934

L—4857

S = 8 for all sizes.

All weights are approximate.

Standard Special Castings for High Pressure Service

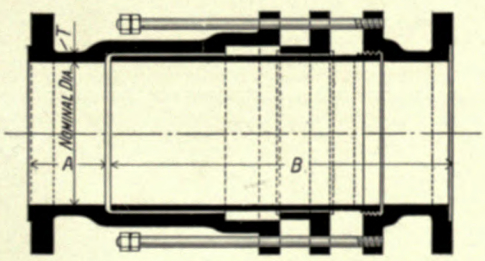


Standard Steel Tees with Flanged Branches, High Pressure Service*

Table No. 69. Code Word, **Fer**

Code Terminal	Nominal Diam., Ins. e	Nominal Diam., Ins. f	Class	l	p	Approx. Weight Pounds
atum	12	8	F	15	15	Made only to order in steel
ance	12	8	H	15	15	
arizo	14	8	F	16	16	
averi	14	8	H	16	16	
alite	16	8	F	17	17	
atima	16	8	H	17	17	
biate	18	8	F	18	18	
bione	18	8	H	18	18	
biene	20	8	F	19	19	
bill	20	8	H	19	19	
borne	24	10	F	21	21	
cana	24	12	F	21	21	
cape	24	14	F	21	21	
cire	24	16	F	21	21	
del	24	18	F	21	21	
deros	24	20	F	21	21	
deur	30	12	E	15	24	
dra	30	12	F	15	24	
dangis	30	14	E	18	26	
darb	30	14	F	18	26	
dort	30	16	E	19	26	
dalt	30	16	F	19	26	
dering	30	18	E	20	26	
dellos	30	18	F	20	26	
ebam	30	20	E	21	26	
entib	30	20	F	21	26	
elazo	36	12	E	15	27	
estro	36	12	F	15	27	
erolla	36	14	E	18	29	
eriate	36	14	F	18	29	
ebas	36	16	E	19	29	
ently	36	16	F	19	29	
form	36	18	E	20	29	
falcon	36	18	F	20	29	
gamos	36	20	E	21	29	
gareo	36	20	F	21	29	
igab	36	24	E	23	29	
igadu	36	24	F	23	29	

L—4967



Expansion Joint for High Pressure Service

Expansion Joint, High Pressure

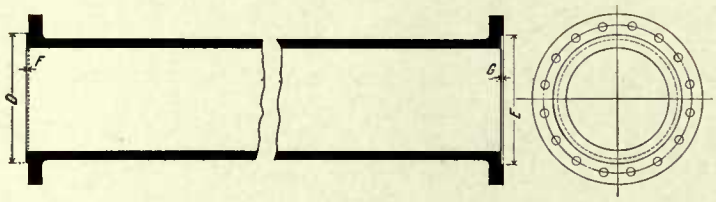
Table No. 70. Code Word, **Fil**

Code Terminal	Nom'l Diam. Inches	A	B	T	Approx. Weight Pounds
andi	4	5.00	15	.57	128
aca	6	5.00	17	.61	207
amus	8	5.50	18	.71	329
bero	10	6.00	19	.80	474
bio	12	6.00	20	.89	650

P—41

*All flanges for high pressure service should be ordered "Tongue and Groove," or "Tongue and Recess." See Table No. 72. For diameter of flanges, bolt circles, etc., see Table No. 71.

All weights are approximate.

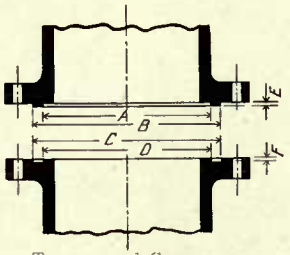


Standard Flanged Pipe for High Pressure. TABLE No. 71*

Code Term'l	Nominal Diam. Inches	Diam. of Flange Inches	Diam. of Bolt Circle, Inches	No. of Bolts	Class E—500-Foot Head, 217 Pounds Pressure — Code Word, Flat						Class F—600-Foot Head, 260 Pounds Pressure — Code Word, Flen					
					Thickness Inches	Weight, Pounds per Foot	Weight, Pounds per Length	Weight, Pounds per Single Flange	Diam. of Bolts Inches	Weight Bolts Single Joint Lbs.	Thickness Inches	Weight, Pounds per Foot	Weight, Pounds per Length	Weight, Pounds per Single Flange	Diam. of Bolt Inches	Weight Bolts Single Joint Lbs.
atore	6	12.50	10.63	12	.58	37.74	496.00	21.32	¾	10.94	.61	39.52	519.00	22.17	¾	11.06
avel	8	15.00	13.00	12	.66	54.66	718.00	31.25	⅞	16.42	.71	60.61	794.00	33.20	⅞	16.68
arca	10	17.50	15.25	16	.74	78.74	1032.00	43.47	⅞	22.54	.80	84.67	1109.00	46.63	⅞	23.04
aril	12	20.00	17.75	16	.82	104.15	1366.00	58.20	⅞	23.20	.89	112.43	1474.00	62.48	⅞	23.74
abaris	14	22.50	20.00	20	.90	133.08	1748.00	75.63	⅞	41.44	.99	146.22	1919.00	82.27	⅞	42.58
beran	16	25.00	22.50	20	.98	165.00	2173.00	96.57	1	42.50	1.08	180.79	2381.00	105.62	1	43.82
bell	18	27.00	24.50	24	1.07	202.32	2650.00	111.24	1	52.37	1.17	219.81	2879.00	120.88	1	53.95
bril	20	29.50	26.75	24	1.15	222.18	2939.90	136.65	1⅛	74.11	1.27	262.52	3450.00	149.95	1⅛	76.51
dicort	24	34.00	31.25	28	1.31	328.52	4311.00	184.53	1¼	118.36	1.45	361.64	4746.00	203.05	1¼	122.47
engra	30	41 50	38.00	32	1.55	484.71	6443.00	313.50	1⅜	181.70	1.73	537.94	7126.00	335.11	1½	233.12
iculo	36	48.50	44.75	36	1.80	674 19	8997.00	453.12	1½	266.22	2.02	748.72	9950.00	482.83	1⅝	333.90
					Class G—700-Foot Head, 304 Pounds Pressure — Code Word, Flob						Class H—800-Foot Head, 347 Pounds Pressure — Code Word, Flus					
atore	6	12.50	10.63	12	.65	42.85	560.00	22.80	¾	11.24	.69	45.22	591.00	24.04	¾	11.42
avel	8	15.00	13.00	12	.75	65.05	848.00	33.91	⅞	16.92	.80	68.79	898.00	36.08	⅞	17.28
arca	10	17.50	15.25	16	.86	92.54	1206.00	48.08	⅞	23.53	.92	98.47	1284.00	51.13	⅞	24.02
aril	12	20.00	17.75	16	.97	124.63	1625.00	64.91	1	24.40	1.04	132.91	1734.00	69.43	1	34.62
abaris	14	22.50	20.00	20	1.07	160.16	2092.00	84.98	1	43.64	1.16	172.58	2255.00	91.86	1	44.86
beran	16	25.00	22.50	20	1.18	199.16	2608.00	108.98	1⅛	45.14	1.27	214.94	2812.00	116.43	1⅛	63.76
bell	18	27.00	24.50	24	1.28	244.61	3183 00	124.06	1⅛	76.80	1.39	264.13	3437.00	133.74	1⅛	78.94
bril	20	29.50	26.75	24	1.39	294.39	3841.00	154.00	1¼	103.46	1.51	318.30	4153.00	166.54	1¼	106.49

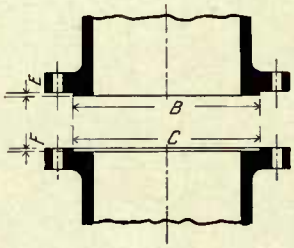
* Flanges as ordered, per Table No. 72.

L—4967



Tongue and Groove

* Flanges can be made either tongue and groove or tongue and recess, as shown in Table No. 72.



Tongue and Recess

Tongue and Groove Joint — TABLE No. 72 — Tongue and Recess Joint

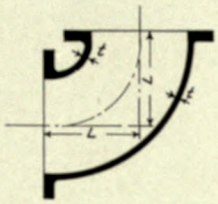
Code Terminal	Nominal Diam. Inches	Code Word, For — A	B	C	D	E	F	Code Word, Fres — B	C	E	F
atore	6	7.38	8.38	8.44	7.31	.19	.13	8.38	8.44	.19	.13
avel	8	9.38	10.63	10.69	9.31	.25	.19	10.63	10.69	.25	.19
arca	10	11.25	12.75	12.81	11.19	.25	.19	12.75	12.81	.25	.19
aril	12	13.75	15.25	15.31	13.69	.25	.19	15.25	15.31	.25	.19
abaris	14	15.00	16.50	16.56	14.94	.25	.19	16.50	16.56	.25	.19
beran	16	16.75	18.50	18.56	16.69	.25	.19	18.50	18.56	.25	.19
bell	18	19.00	21.00	21.06	18.94	.25	.19	21.00	21.06	.25	.19
bril	20	21.00	23.00	23.06	20.94	.25	.19	23.00	23.06	.25	.19
dicort	24	25.50	27.50	27.56	25.44	.25	.19	27.50	27.56	.25	.19
engra	30	32.00	34.50	34.56	31.94	.31	.25	34.50	34.56	.31	.25
iculo	36	38.50	41.50	41.56	38.44	.31	.25	41.50	41.56	.31	.25

For flange diameters, bolt circles and bolts, see Table No. 71 above.

J. B. L.—D 7

Standard Flanged Special Castings

For 250 Pounds Working Pressure

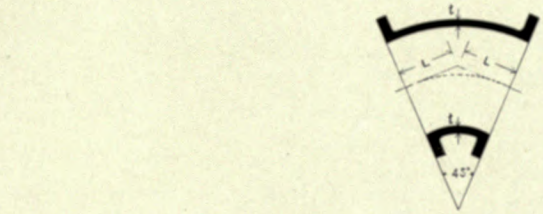


Standard Flanged ¼ Curves*

TABLE No. 73. Code Word, **Frin**

Code Terminal	Nominal Diameter Inches	Class	t	L	Approx. Weight Pounds
ame	4	F	.57	7.00	51
atore	6	F	.61	8.50	93
avel	8	F	.71	10.00	159
arca	10	F	.80	11.50	240
aril	12	F	.89	13.00	337
anos	14	F	.99	14.50	479
basse	16	F	1.08	16.00	630
belge	18	F	1.17	18.00	821
bucu	20	F	1.27	20.00	1068
deros	24	F	1.45	24.00	1647

See note below regarding flanges. P—30

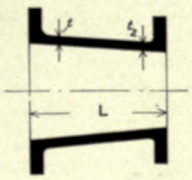


Standard Flanged ⅛ Curves*

TABLE No. 74. Code Word, **Frol**

Code Terminal	Nominal Diameter Inches	Class	t	L	Approx. Weight Pounds
ame	4	F	.57	4.50	53
atore	6	F	.61	5.50	89
avel	8	F	.71	6.00	140
arca	10	F	.80	7.00	209
aril	12	F	.89	8.00	301
anos	14	F	.99	8.00	390
basse	16	F	1.08	9.00	516
belge	18	F	1.17	9.50	632
bucu	20	F	1.27	10.00	780
deros	24	F	1.45	11.50	1133

P—28



Standard Flanged Reducers*

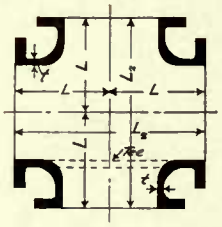
TABLE No. 75. Code Word, **Frud**

Code Terminal	Nominal Diameter Inches	Class	t	t_2	L	Approximate Weight Pounds
aras	6 x 4	F	.61	.57	9	66
atico	8 x 6	F	.71	.61	11	112
anis	10 x 8	F	.80	.71	12	169
acho	12 x 10	F	.89	.80	14	245
akor	14 x 12	F	.99	.89	16	347
basan	16 x 12	F	1.08	.89	16	398
bara	16 x 14	F	1.08	.99	16	445
belge	18 x 16	F	1.17	1.08	18	582
boroi	20 x 16	F	1.27	1.08	20	680
bonne	20 x 18	F	1.27	1.17	20	753
della	24 x 20	F	1.45	1.27	22	1016

*All flanges are "Tongue and Groove" or "Tongue and Recess" as shown in Table No. 72. P—35
For flange diameters, bolt circles, etc., see Table No. 71.
All weights are approximate.

Standard Flanged Special Castings—Continued

For 250 Pounds Working Pressure

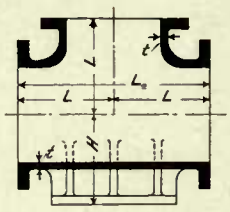


Standard Flanged Tees and Crosses*

TABLE No. 76

Code Term'l	Nominal Diameter, In.	Class	L	L_2	Approx. Weight Pounds	
					Tee	Cross
					Code Furl	Code Fut
ame	4	F	7.00	14.00	82	105
atore	6	F	8.50	17.00	145	183
avel	8	F	10.00	20.00		
arca	10	F	11.50	23.00		
aril	12	F	13.00	26.00		
acity	14	F	14.50	29.00		
bevel	16	F	16.00	32.00		
belon	18	F	18.00	36.00		
bunt	20	F	20.00	40.00		
deral	24	F	24.00	48.00		

P—32



Standard Flanged Base Tees*

TABLE No. 77. Code Word, **Gan**

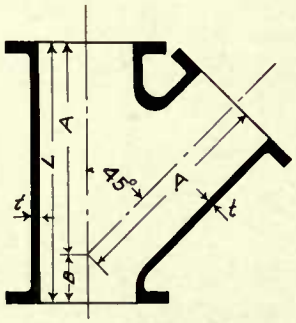
Code Term'l	Nominal Diameter, In.	Class	L	L_2	H	Approx. Weight Pounds
ame	4	F	7.00	14.00	7.00	107
atore	6	F	8.50	17.00	8.00	182
avel	8	F	10.00	20.00	9.25	
arca	10	F	11.50	23.00	10.50	
aril	12	F	13.00	26.00	11.00	
acity	14	F	14.50	29.00	14.00	
bevel	16	F	16.00	32.00	15.25	
belon	18	F	18.00	36.00	15.50	
bunt	20	F	20.00	40.00	16.75	
deral	24	F	24.00	48.00	18.75	

P—34

8 to 24-inch sizes are made in steel, to order only

Standard Flanged Y Branches

TABLE No. 78. Code Word, **Ges**



*Standard Flanged Y Branches

Code Terminal	Nom'l Diam. Inches	Class	A	B	L	Approx. Weight Pounds
ame	4	F	13.50	3.00	16.50	97
atore	6	F	17.50	4.00	21.50	188
avel	8	F	20.00	5.00	25.00	
arca	10	F	23.00	5.50	28.50	
aril	12	F	26.50	6.00	32.50	
acity	14	F	30.00	6.50	36.50	
bevel	16	F	33.00	7.50	40.50	
belon	18	F	36.00	8.00	44.00	
bunt	20	F	38.00	8.50	46.50	
deral	24	F	44.00	10.00	54.00	

P—27

* All flanges are "Tongue and Groove" or "Tongue and Recess," as shown in Table No. 72.
For flange diameters, bolt circles, etc., see Table No. 71.
8 to 24-inch sizes are made in steel, to order only.
All weights are approximate.

Standard Bell and Spigot Gas Pipe

Standard Gas Pipe. The tables of standard gas pipe and the following tables of special castings, were adopted as the standard of the American Gas Light Association at the thirty-third annual meeting, held at Milwaukee, Wis., October 18th to 20th, 1905, and have been accepted by this Company as standards for gas pipe and specials. In Table No. 79 the thicknesses and weights for pipe are given for service under ordinary conditions. In Table No. 80 somewhat heavier pipe are listed, as used by many gas engineers for service in the larger cities and towns, under paved streets, and especially those on which the traffic is heavy. They are also preferably used for lines laid in newly made streets, or where the sub-soil conditions are such as to make the heavier pipe desirable. The past few years have shown a very marked increase in the quantity of these heavier pipe that is being put down. Evidently the lessened breakage and leakage resulting from their use is appreciated.

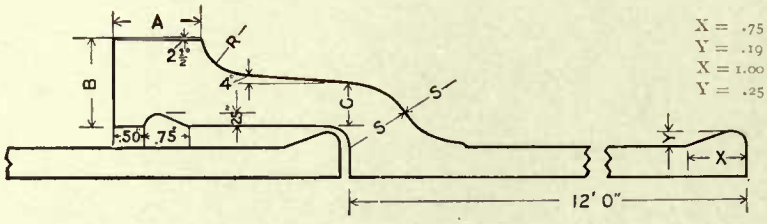
The two standards of bell differ only in joint room and in the form of the lead groove, and either class of pipe may be supplied to order, with either lead groove, as preferred. For cement joints, we make pipe with and without grooves, some of our friends preferring simply plain bells.

As to special castings, we are as rapidly as possible making the necessary preparation in new patterns, fixtures, etc., to enable us to supply any of the standards called for. Meanwhile, unless these standards are specified, we may furnish special castings from regular patterns of the nearest dimensions and weights. All weights for gas specials are estimated, and some castings, therefore, may exceed somewhat the usual variation percentages. All of our Standard Gas Specials are made with grooves in bells as shown in cut above Table No. 79.

Standard short length bell and spigot pipe in lengths to lay 12 inches, varying by 6-inch steps up to lengths to lay 72 inches, are classed as Special Castings. In ordering these short length bell and spigot pieces for gas pipe, Table No. 45 may be used with the code stem "Gonba" prefixed to the terminals.

Standard Flanged Pipe for Gas, see page 116.

Standard Gas Pipe



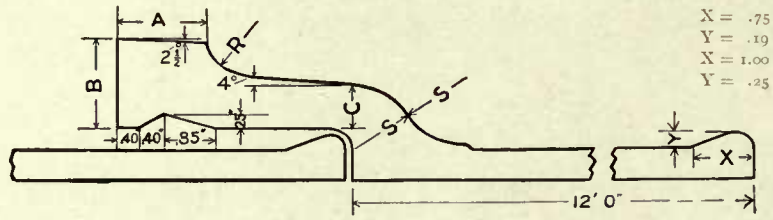
X = .75 inch on 4 and 6 inch
Y = .19 inch on 4 and 6 inch
X = 1.00 inch on 8 to 48 inch
Y = .25 inch on 8 to 48 inch

Table No. 79. Code Word, **Gil**

Code Terminal	Nominal Diameter Inches	Outside Diameter Inches	Thickness Inches	Diameter Sockets Inches		Depth Sockets Inches		Weight Pounds per	
				Pipe	Special Castings	Pipe	Special Castings	Foot	Length
ame	4	4.80	.40	5.80	5.80	4.00	4.00	19.3	232
atore	6	6.90	.43	7.90	7.90	4.00	4.00	30.3	364
avel	8	9.05	.45	10.05	10.05	4.00	4.00	42.0	504
arca	10	11.10	.49	12.10	12.10	4.00	4.00	55.8	670
aril	12	13.20	.54	14.20	14.20	4.50	4.50	73.8	885
beran	16	17.20	.62	18.30	18.30	4.50	4.50	111.3	1334
bril	20	21.34	.68	22.59	22.59	4.50	4.50	151.4	1817
dicort	24	25.52	.76	26.77	26.77	5.00	5.00	204.1	2449
engra	30	31.74	.85	32.99	32.99	5.00	5.00	282.2	3392
iculo	36	37.96	.95	39.21	39.21	5.00	5.00	379.0	4549
lieu	42	44.20	1.07	45.45	45.45	5.00	5.00	497.3	5967
tras	48	50.50	1.26	51.75	51.75	5.00	5.00	664.0	7968

P—56

Standard Heavy Gas Pipe



X = .75 inch on 4 and 6 inch
Y = .19 inch on 4 and 6 inch
X = 1.00 inch on 8 to 48 inch
Y = .25 inch on 8 to 48 inch

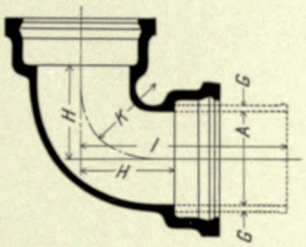
Table No. 80. Code Word, **Gon**

Code Terminal	Nominal Diameter Inches	Outside Diameter Inches	Thickness Inches	Diameter Sockets Inches		Depth Sockets Inches		Weight Pounds per	
				Pipe	Special Castings	Pipe	Special Castings	Foot	Length
ame	4	5.00	.42	5.80	5.80	4.00	4.00	20.0	240
atore	6	7.10	.47	7.90	7.90	4.00	4.00	32.8	394
avel	8	9.05	.49	9.85	9.85	4.00	4.00	45.3	544
arca	10	11.10	.51	11.90	11.90	4.00	4.00	58.7	703
aril	12	13.20	.57	14.00	14.00	4.50	4.50	76.1	913
beran	16	17.40	.65	18.40	18.40	4.50	4.50	117.2	1406
bril	20	21.60	.75	22.60	22.60	4.50	4.50	166.7	2000
dicort	24	25.80	.82	26.80	26.80	5.00	5.00	224.0	2688
engra	30	32.00	1.00	33.00	33.00	5.00	5.00	323.9	3887
iculo	36	38.30	1.05	39.30	39.30	5.00	5.00	442.7	5312
lieu	42	44.50	1.26	45.50	45.50	5.00	5.00	581.3	6975
tras	48	50.80	1.38	51.80	51.80	5.00	5.00	739.6	8875

P—56A

LIBRARY OF THE UNIVERSITY OF CALIFORNIA

Standard Special Castings for Gas

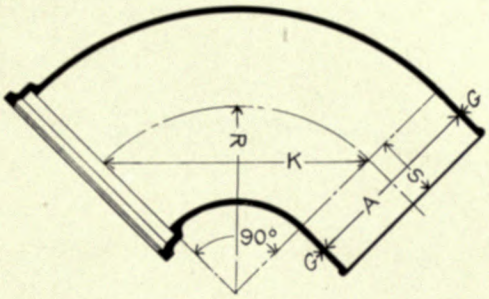


Standard ¼ Bends, 4 to 24 inches

TABLE NO. 81

Code Terminal	Nom'l Diam. Inches	G	H	I	K	Approx. Weight Pounds 2 Bells Code **Grat**	Approx. Weight Pounds 1 Bell Code **Gren**
ame	4	.40	4.50	15.00	3.00	61	51
atore	6	.43	6.25	16.50	4.50	95	83
avel	8	.45	8.00	18.00	6.00	139	123
arca	10	.49	9.75	19.50	7.50	185	169
aril	12	.54	11.25	21.00	9.00	263	239
basse	16	.62	14.50	24.00	12.00	449	406
bucu	20	.68	17.75	27.00	15.00	667	608
deros	24	.76	21.00	30.00	18.00	...	901

P—5

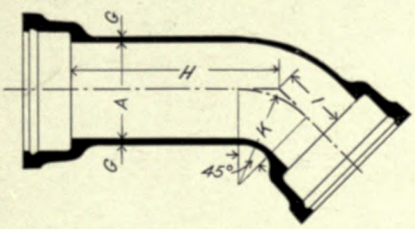


Standard ¼ Curves, 24 to 48 inches

TABLE NO. 82. Code Word, **Grid**

Code Terminal	Nom'l Diam. Inches	G	K	R	S	Approx. Weight Pounds
deros	24	.76	42.40	30	12	1145
etra	30	.85	50.90	36	12	1782
igar	36	.95	67.90	48	12	2923
lapel	42	1.07	84.80	60	12	4544
ocet	48	1.26	93.32	66	12	6531

P—6

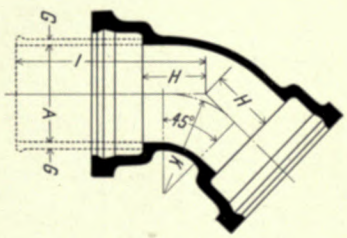


Standard ⅛ Bends, Type 2

TABLE NO. 84. Code Word, **Grol**

Code Terminal	Nom'l Diam. Inches	G	H	I	K	Approx. Weight Pounds
ame	4	.40	13.65	3.16	4	74
atore	6	.43	14.48	4.23	6	113
avel	8	.45	15.31	5.31	8	161
arca	10	.49	16.14	6.39	10	210
aril	12	.54	16.97	7.22	12	291

P—6A



Standard ⅛ Bends, Type 1

TABLE NO. 83

Code Terminal	Nom'l Diam. Inches	G	H	I	K	Approx. Weight Pounds 2 Bells Code **Gruf**	Approx. Weight Pounds 1 Bell Code **Gur**
ame	4	.40	3.16	20.50	4	59	59
atore	6	.43	4.23	21.50	6	90	94
avel	8	.45	5.31	22.25	8	129	135
arca	10	.49	6.39	23.00	10	168	182
aril	12	.54	7.22	24.00	12	237	252
basse	16	.62	9.12	25.00	16	397	407
bucu	20	.68	11.03	27.25	20	577	598
deros	24	.76	12.94	29.00	24	...	865
etra	30	.85	15.67	31.50	30	...	1298

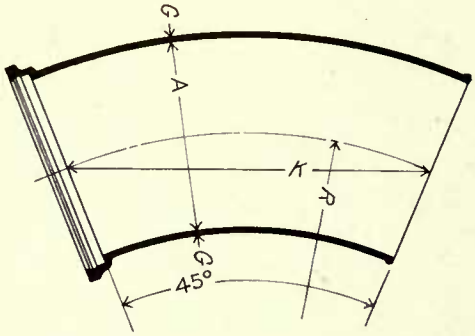
P—3

See notes on page 105. All weights are approximate. See following page for ⅛ curves, 20 to 48-inch.

Standard Special Castings for Gas—Continued

Standard 1/8 Curves

TABLE No. 85. Code Word, **Guz**



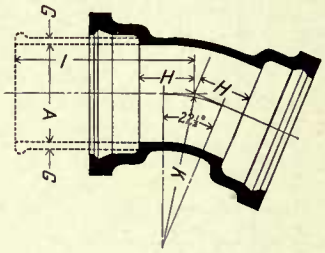
Code Terminal	Nom'l Diam. Inches	G	K	R	Approx. Weight Pounds
bucu . . .	20	.68	36.70	48	601
deros . . .	24	.76	45.90	60	960
etra . . .	30	.85	45.90	60	1324
igar . . .	36	.95	68.90	90	2443
lapel . . .	42	1.07	68.90	90	3204
ocet . . .	48	1.26	68.90	90	4248

P—4

Standard 1/16 Bends, Type 1

TABLE No. 86

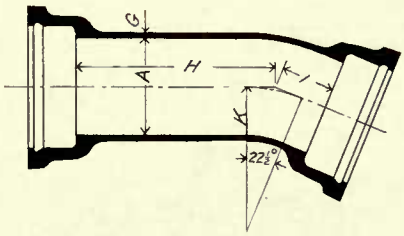
Code Terminal	Nom'l Diam. Inches	G	H	I	K	Approx. Weight Pounds	
						2 Bells	1 Bell
						Code **Hal**	Code **Hed**
ame .	4	.40	2.69	20.25	6	58	58
atore .	6	.43	3.53	20.75	9	87	91
avel .	8	.45	4.38	21.25	12	124	130
arca .	10	.49	5.22	22.00	15	160	174
aril .	12	.54	5.81	22.50	18	223	238
basse	16	.62	7.27	23.75	24	369	385
bucu .	20	.68	8.71	24.75	30	530	550
deros	24	.76	10.16	26.00	36	...	787
etra .	30	.85	12.20	27.75	45	...	1164



P—1

Standard 1/16 Bends, Type 2

TABLE No. 87. Code Word, **Him**

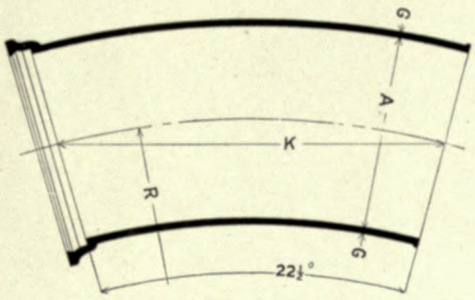


Code Terminal	Nom'l Diam. Inches	G	H	I	K	Approx. Weight Pounds
ame . .	4	.40	14.70	2.69	6	75
atore . .	6	.43	15.53	3.53	9	114
avel . .	8	.45	16.38	4.38	12	162
arca . .	10	.49	17.25	5.22	15	211
aril . .	12	.54	17.81	5.81	18	290

P—6B

See notes on page 105.
All weights are approximate.
See following page for 1/8 curves, 20 to 48-inch.

Standard Special Castings for Gas—Continued



Standard $\frac{1}{16}$ Curves

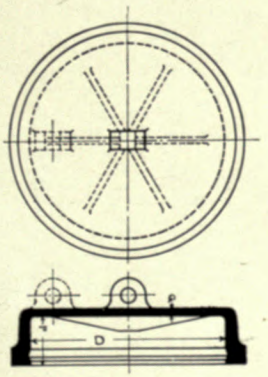
Table No. 88. Code Word, **Hon**

Code Terminal	Nominal Diameter Inches	G	K	R	Approximate Weight Pounds
bucu	20	.68	37.50	96	602
deros	24	.76	46.80	120	960
etra	30	.85	46.80	120	1326
igar	36	.95	70.20	180	2443
lapel	42	1.07	70.20	180	3204
ocet	48	1.26	70.20	180	4248

P—2

Standard Caps

Table No. 89. Code Word, **Hus**



16 to 30, two ribs
36 to 48, three ribs

Code Terminal	Nominal Diameter Inches	D	F	G	Approx. Weight Pounds
ame	4	5.80	4.00	.40	24
atore	6	7.90	4.00	.43	35
avel	8	10.05	4.00	.45	50
arca	10	12.10	4.00	.49	63
aril	12	14.20	4.50	.54	92
basse	16	18.30	4.50	.62	152
bucu	20	22.59	4.50	.68	219
deros	24	26.77	5.00	.76	314
etra	30	32.99	5.00	.85	467
igar	36	39.21	5.00	.95	665
lapel	42	45.45	5.00	1.07	936
ocet	48	51.75	5.00	1.26	1294

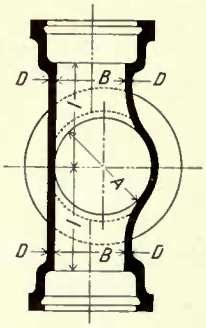
Lugs at center 12 to 24 inches, at side 30 to 48 inches

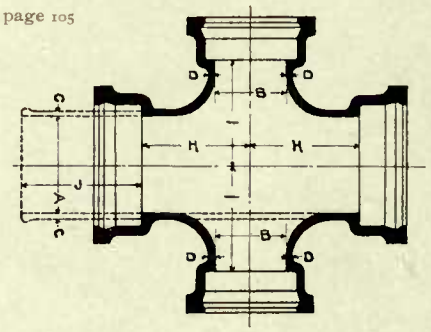
P—17

See notes on page 105.
For plugs, hat flanges and bushings, see page 114.
For split sleeves, hub sleeves, solid sleeves, service sleeves, see page 113.
All weights are approximate.

Standard Special Castings for Gas

See notes on page 105





Standard Tees and Crosses for Gas. TABLE No. 90

Code Terminal	Nominal Diameter Inches		Thickness Inches		H	I	J	Weight, Pounds			
								Crosses		Tees	
								4 Bells	3 Bells	3 Bells	2 Bells
	A	B	C	D				Code **lbas**	Code **lbet**	Code **lbiv**	Code **lboc**
ame	4	4	.40	.40	8	8.00	20	143	136	108	101
aras	6	4	.43	.40	8	8.00	20	178	171	143	135
atore	6	6	.43	.43	8	8.00	20	199	191	153	145
anha	8	4	.45	.40	10	10.00	22	230	221	195	185
atico	8	6	.45	.43	10	10.00	22	262	253	211	201
avel	8	8	.45	.45	10	10.00	22	291	281	225	215
afft	10	4	.49	.40	12	11.00	24	286	280	249	243
anlon	10	6	.49	.43	12	12.00	24	328	322	273	267
anis	10	8	.49	.45	12	12.00	24	366	360	291	285
arco	10	10	.49	.49	12	12.00	24	406	400	312	305
aclle	12	4	.54	.40	14	13.00	26	399	387	357	345
amus	12	6	.54	.43	14	13.00	26	426	415	370	359
atum	12	8	.54	.45	14	13.00	26	465	454	390	378
acho	12	10	.54	.49	14	14.00	26	503	492	409	398
aril	12	12	.54	.54	14	14.00	26	557	545	435	424
avate	16	6	.62	.43	17	15.50	29	651	629	593	571
allte	16	8	.62	.45	17	15.50	29	694	671	614	592
andos	16	10	.62	.49	17	16.00	29	734	712	635	612
barot	16	12	.62	.54	17	17.00	29	794	771	664	642
beran	16	16	.62	.62	17	17.00	29	920	898	728	705
beure	20	6	.68	.43	19	16.00	31	878	850	824	796
biene	20	8	.68	.45	19	16.00	31	930	902	850	822
binal	20	10	.68	.49	19	17.00	31	984	957	877	850
bio	20	12	.68	.54	19	17.00	31	1011	983	890	863
buron	20	16	.68	.62	19	19.00	31	1170	1143	970	943
bril	20	20	.68	.68	19	19.00	31	1248	1220	948	920
buls	24	8	.76	.45	21	19.00	33	1266	1219	1189	1143
borne	24	10	.76	.49	21	19.00	33	1314	1267	1213	1167
cana	24	12	.76	.54	21	20.00	33	1375	1328	1244	1197
cire	24	16	.76	.62	21	21.00	33	1452	1405	1252	1204
deros	24	20	.76	.68	21	21.00	33	1632	1585	1372	1326
dicort	24	24	.76	.76	21	21.00	33	1717	1670	1398	1351
deaw	30	10	.85	.49	15	23.00	27	1489	1432	1383	1327
deur	30	12	.85	.54	15	23.00	27	1550	1489	1411	1355
dort	30	16	.85	.62	19	24.00	29	1842	1786	1646	1590
entis	30	20	.85	.68	21	24.00	34	2086	2051	1811	1776
etra	30	24	.85	.76	23	24.00	36	2306	2271	1964	1929
engro	30	30	.85	.85	26	26.00	41	2669	2677	2187	2195
elazo	36	12	.95	.54	15	25.00	27	1934	1872	1808	1746
ebas	36	16	.95	.62	19	26.00	29	2235	2173	2073	2011
gamos	36	20	.95	.68	21	27.00	34	2571	2538	2298	2265
igab	36	24	.95	.76	23	27.00	36	2846	2813	2493	2459
igar	36	30	.95	.85	26	27.00	41	3239	3253	2779	2804
iculo	36	36	.95	.95	29	29.00	44	3684	3708	3084	3108

All weights are approximate.

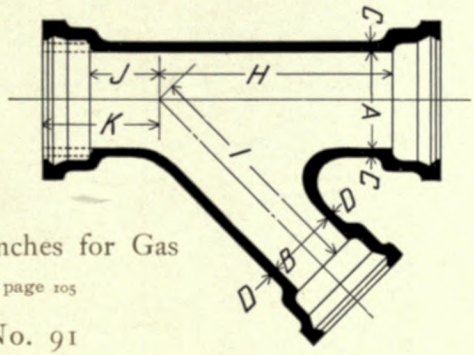
P—7

Standard Special Castings for Gas—Continued

Standard Tees and Crosses for Gas. TABLE No. 90—Continued

Code Terminal	Nominal Diameter Inches		Thickness Inches		H	I	J	Weight, Pounds			
								Crosses		Tees	
	A	B	C	D				4 Bells	3 Bells	3 Bells	2 Bells
								Code **lbas**	Code **lbet**	Code **lbiv**	Code **lboc**
ibus	42	16	1.07	.62	19	30.00	29	2960	2878	2733	2651
icolea	42	20	1.07	.68	21	30.00	34	3169	3125	2912	2869
linos	42	24	1.07	.76	23	30.00	36	3487	3443	3147	3103
lard	42	30	1.07	.85	26	30.00	41	3875	3907	3454	3486
lapel	42	36	1.07	.95	29	30.00	44	4396	4427	3828	3859
leaba	42	42	1.07	1.07	32	32.00	47	4923	4954	4203	4235
nary	48	16	1.26	.62	19	33.00	29	3616	3471	3429	3283
ostet	48	20	1.26	.68	21	33.00	34	3916	3923	3680	3688
orgen	48	24	1.26	.76	23	33.00	36	4290	4296	3968	3975
orios	48	30	1.26	.85	26	33.00	41	4768	4877	4359	4468
oltoe	48	36	1.26	.95	29	33.00	44	5332	5440	4794	4902
ocet	48	42	1.26	1.07	32	33.00	47	5966	6075	5262	5370
tigab	48	48	1.26	1.26	35	35.00	50	6720	6829	5793	5901

P—7



Standard Y Branches for Gas

See notes on page 105

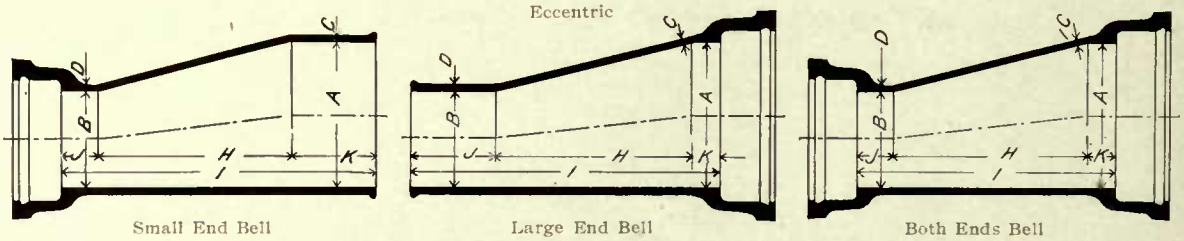
TABLE No. 91

Code Terminal	Nominal Diameter Inches		Thickness Inches		H	I	J	K	Weight, Pounds	
									3 Bells	2 Bells
	A	B	C	D					Code **lcat**	Code **lcev**
ame	4	4	.40	.40	11.15	11.15	3.16	7.16	106	87
aras	6	4	.43	.40	15.50	15.25	4.25	8.25	157	131
atore	6	6	.43	.43	15.50	15.50	4.25	8.25	174	148
anha	8	4	.45	.40	19.30	18.80	5.31	9.31	218	184
atico	8	6	.45	.43	19.30	19.05	5.31	9.31	238	203
avel	8	8	.45	.45	19.30	19.30	5.31	9.31	259	225
afft	10	4	.49	.40	22.75	22.00	6.75	10.75	290	250
anion	10	6	.49	.43	22.75	22.25	6.75	10.75	310	269
anis	10	8	.49	.45	22.75	22.50	6.75	10.75	333	293
arca	10	10	.49	.49	22.75	22.75	6.75	10.75	358	318
aclie	12	4	.54	.40	26.75	26.00	7.25	11.75	406	352
amus	12	6	.54	.43	26.75	26.25	7.25	11.75	421	368
atum	12	8	.54	.45	26.75	26.50	7.25	11.75	453	400
acho	12	10	.54	.49	26.75	26.75	7.25	11.75	479	426
aril	12	12	.54	.54	26.75	26.75	7.25	11.75	518	465
beran	16	16	.62	.62	33.13	33.13	9.12	13.62	883	798
bril	20	20	.68	.68	38.53	38.53	11.03	15.53	1298	1184
discort	24	24	.76	.76	43.00	43.00	13.00	18.00	1879	1723
engra	30	30	.85	.85	52.50	52.50	13.75	18.75	2890	2684
iculo	36	36	.95	.95	60.38	60.38	18.37	23.37	4269	4006
leaba	42	42	1.07	1.07	70.00	70.00	22.00	27.00	6244	5899
tigab	48	48	1.26	1.26	80.00	80.00	25.00	30.00	9104	8704

All weights are approximate

P—8

Standard Special Castings for Gas



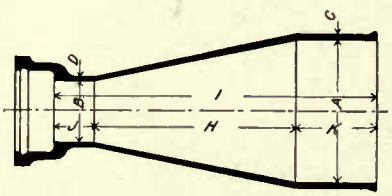
Small End Bell | Large End Bell | Both Ends Bell

Standard Reducers. TABLE No. 92

Code Terminal	Nominal Diameter Inches		Thickness Inches		H	Small End Bell, Code Word, **lcib**				Large End Bell, Code Word, **lcoc**				Both Ends Bell, Code Word, **lcud**			
	A	B	C	D		I	J	K	Approx. Weight Lbs.	I	J	K	Approx. Weight Lbs.	I	J	K	Approx. Weight Lbs.
acile	4	3	.40	.39	7.0	16.0	2.5	6.5	39	16.0	6.5	2.5	45	12.0	2.5	2.5	57
ame	6	3	.43	.39	12.0	21.0	2.5	6.5	55	21.0	6.5	2.5	69	17.0	2.5	2.5	81
aras	6	4	.43	.49	7.0	16.0	2.5	6.5	57	16.0	6.5	2.5	64	12.0	2.5	2.5	83
anha	8	4	.45	.40	15.0	24.0	2.5	6.5	84	24.0	6.5	2.5	100	20.0	2.5	2.5	119
atico	8	6	.45	.43	7.0	16.0	2.5	6.5	81	16.0	6.5	2.5	90	12.0	2.5	2.5	116
afft	10	4	.49	.40	23.0	32.0	2.5	6.5	122	32.0	6.5	2.5	143	28.0	2.5	2.5	162
anion	10	6	.49	.43	15.0	24.0	2.5	6.5	118	24.0	6.5	2.5	132	20.0	2.5	2.5	158
anis	10	8	.49	.45	7.0	16.0	2.5	6.5	110	16.0	6.5	2.5	115	12.0	2.5	2.5	150
amus	12	6	.54	.43	23.0	33.0	3.0	7.0	172	32.5	7.0	2.5	199	28.5	3.0	2.5	225
atum	12	8	.54	.45	15.0	25.0	3.0	7.0	162	24.5	7.0	2.5	181	20.5	3.0	2.5	216
acho	12	10	.54	.49	7.0	17.0	3.0	7.0	144	16.5	7.0	2.5	158	12.5	3.0	2.5	198
alite	16	8	.62	.45	32.0	42.0	3.0	7.0	302	41.5	7.0	2.5	353	37.5	3.0	2.5	388
andros	16	10	.62	.49	24.0	34.0	3.0	7.0	282	33.5	7.0	2.5	327	29.5	3.0	2.5	368
barot	16	12	.62	.54	15.0	24.5	2.5	7.0	258	24.5	7.0	2.5	290	20.0	2.5	2.5	344
binai	20	10	.68	.49	40.0	50.0	3.0	7.0	467	49.5	7.0	2.5	540	45.5	3.0	2.5	580
bio	20	12	.68	.54	32.0	41.5	2.5	7.0	448	41.5	7.0	2.5	508	37.0	2.5	2.5	561
buron	20	16	.68	.62	16.0	25.5	2.5	7.0	387	25.5	7.0	2.5	415	21.0	2.5	2.5	501
cire	24	16	.76	.62	30.5	42.0	3.5	8.0	642	41.5	8.0	3.0	711	37.0	3.5	3.0	796
deros	24	20	.76	.68	14.5	26.0	3.5	8.0	527	25.5	8.0	3.0	568	21.0	3.5	3.0	682
entis	30	20	.85	.68	39.0	50.5	3.5	8.0	1023	50.0	8.0	3.0	1115	45.5	3.5	3.0	1228
etra	30	24	.85	.76	24.0	35.0	3.0	8.0	895	35.0	8.0	3.0	946	30.0	3.0	3.0	1101
eces	36	24	.95	.76	48.0	59.0	3.0	8.0	1569	59.0	8.0	3.0	1678	54.0	3.0	3.0	1833
eret	36	30	.95	.85	24.0	35.0	3.0	8.0	1213	35.0	8.0	3.0	1271	30.0	3.0	3.0	1477
infer	42	30	1.07	.85	48.0	59.0	3.0	8.0	2102	59.0	8.0	3.0	2242	54.0	3.0	3.0	2447
illus	42	36	1.07	.95	24.0	35.0	3.0	8.0	1597	35.0	8.0	3.0	1679	30.0	3.0	3.0	1942
ista	48	36	1.26	.95	48.0	59.0	3.0	8.0	2811	59.0	8.0	3.0	2947	54.0	3.0	3.0	3210
iras	48	42	1.26	1.07	24.0	35.0	3.0	8.0	2121	35.0	8.0	3.0	2174	30.0	3.0	3.0	2520

P—9 B | P—9 A | P—9

Standard Reducers. TABLE No. 93. Code Word, **Idav**



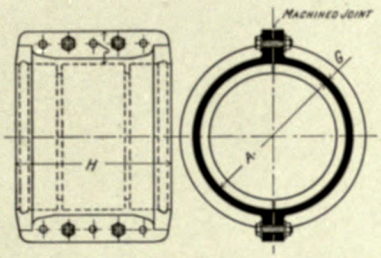
Concentric Reducers for Holder Drips, Vertical Lines in Works, etc.

Code Terminal	Nominal Diameter Inches		Thickness Inches		H	I	J	K	Approx. Weight Pounds
	A	B	C	D					
avero	14	4	.57	.40	20.0	32.0	4.0	8.0	169
atur	14	6	.57	.43	20.0	32.0	4.0	8.0	191
biate	18	8	.64	.45	20.0	32.0	4.0	8.0	269
banea	18	10	.64	.49	20.0	32.0	4.0	8.0	294
cift	24	12	.76	.54	26.0	37.5	3.5	8.0	495
ebam	30	16	.85	.62	26.0	37.5	3.5	8.0	716
entis	30	20	.85	.67	26.0	37.5	3.5	8.0	809
etra	30	24	.85	.76	26.0	37.0	3.0	8.0	932
eret	36	30	.95	.85	32.0	43.0	3.0	8.0	1414
illus	42	36	1.07	.95	32.0	43.0	3.0	8.0	1862
iras	48	42	1.26	1.10	32.0	43.0	3.0	8.0	2473
laret	54	48	1.35	1.26	32.0	43.0	3.0	8.0	3090

All weights are approximate. P—9D

See notes on page 105.

Standard Special Castings for Gas—Continued

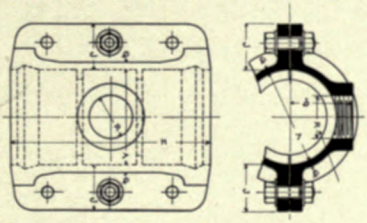


Split Sleeve, Complete with Bolts

TABLE No. 94. Code Word, **Ideb**

Code Term'l	Size In.	A In.	G In.	H In.	J In.	Bolts No.	Bolts Diam. In.	Weight Pounds
aca	2	3.38	.38	8.0	2.75	4	.75	29
acet	3	4.80	.39	12.0	2.75	6	.75	53
ame	4	5.80	.40	12.0	2.75	6	.75	62
atore	6	7.90	.43	12.0	2.75	6	.75	82
avel	8	10.05	.45	15.0	3.00	8	.75	125
arca	10	12.10	.49	15.0	3.00	8	.75	150
arie	12	14.20	.54	15.0	3.00	8	.75	185
basse	16	18.30	.62	18.0	3.75	10	.875	323
bucu	20	22.59	.68	18.0	3.75	10	.875	417
deros	24	26.77	.76	18.0	3.75	10	.875	540
etra	30	32.99	.85	18.0	3.75	10	.875	709
igar	36	39.21	.95	18.0	4.50	10	1.00	934
lapel	42	45.45	1.07	18.0	4.50	10	1.00	1189
ocet	48	51.75	1.26	18.0	4.50	10	1.00	1480

P—16



"R" indicates size of pipe for which the hole is tapped.

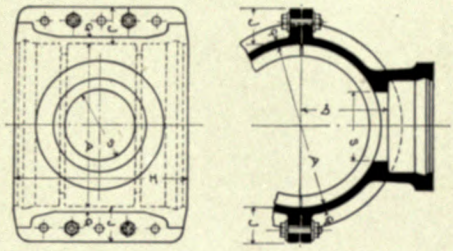
Service Sleeve, Complete with Bolts

TABLE No. 96. Code Word, **Idoc**

Code Term'l	Size In.	A In.	b In.	G In.	H In.	J In.	R In.	Wgt. Lbs.
aca	2	3.38	2.35	.38	8	2.75	1.25	29
amus	2	3.38	2.35	.38	8	2.75	1.50	29
acet	3	4.80	3.40	.38	12	2.75	1.25	54
ani	3	4.80	3.40	.38	12	2.75	1.50	54
ame	4	5.80	3.85	.40	12	2.75	2.00	63
atore	6	7.90	5.27	.43	12	2.75	3.00	88
avel	8	10.05	6.37	.45	15	3.00	3.00	130

P—13

All weights are approximate



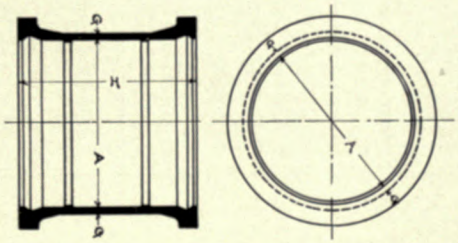
Hub Sleeve, Complete with Bolts

TABLE No. 95. Code Word, **Idic**

Code Terminal	Size In.	A In.	B In.	G In.	H In.	J In.	S In.	Wgt. Lbs.
arca	10 X 4	12.10	6.55	.49	15	3.00	4.00	173
agus	10 X 6	12.10	6.55	.49	18	3.00	6.00	201
arie	12 X 4	14.20	7.64	.54	15	3.00	4.00	207
asis	12 X 6	14.20	7.64	.54	18	3.00	6.00	239
basse	16 X 6	18.30	9.80	.62	18	3.75	6.00	351
bara	16 X 8	18.30	9.80	.62	18	3.75	8.00	363
bucu	20 X 6	22.59	11.97	.68	18	3.75	6.00	443
bonne	20 X 8	22.59	11.97	.68	18	3.75	8.00	454
bunt	20 X 10	22.59	11.97	.68	18	3.75	10.00	462

P—12

May be ordered Double Hub. Add terminal to code word, **Idim.**



Solid Sleeve

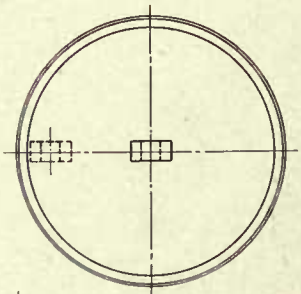
TABLE No. 97. Code Word, **Iduf**

Code Terminal	Size In.	A In.	G In.	H In.	Wgt. Lbs.
aca	2	3.38	.38	8	17
acet	3	4.80	.39	12	35
ame	4	5.80	.40	12	44
atore	6	7.90	.43	12	63
avel	8	10.05	.45	15	97
arca	10	12.10	.49	15	119
arie	12	14.20	.54	15	153
basse	16	18.30	.62	18	268
bucu	20	22.59	.68	18	359
deros	24	26.77	.76	18	478
etra	30	32.99	.85	18	646
igar	36	39.21	.95	18	848
lapel	42	45.45	1.07	18	1103
ocet	48	51.75	1.26	18	1391

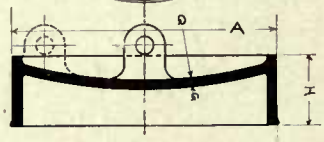
P—11

Standard Special Castings for Gas—Continued

12 to 24 inches inclusive, Lugs at center



30 inches and larger Lugs at side

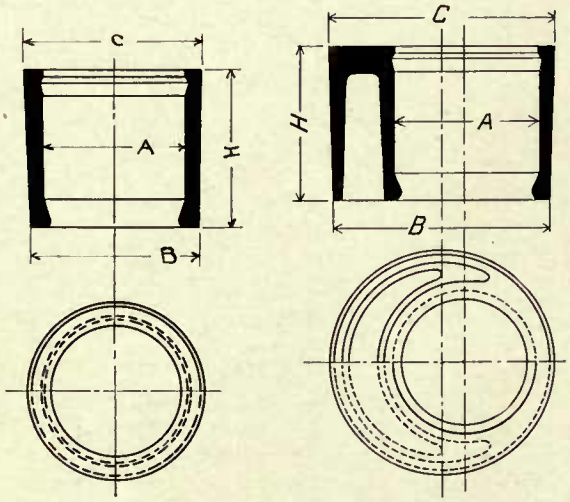


For Patent Screw Plugs, see page 119.

Plugs. Table No. 98. Code Word, **Ifab**

Code Terminal	Size In.	A In.	G In.	H In.	Q In.	Weight Pounds
acet	3	3.80	.40	5.25	4.00	6
ame	4	4.80	.40	5.25	4.00	9
atore	6	6.90	.43	5.25	6.00	15
avel	8	9.05	.45	5.25	8.00	23
arca	10	11.10	.49	5.25	10.00	34
aril	12	13.20	.54	6.00	12.00	56
beran	16	17.20	.62	6.00	22.00	91
bril	20	21.34	.68	6.00	36.00	133
dicoft	24	25.52	.76	6.50	60.00	197
engra	30	31.74	.85	6.50	78.00	308
icujo	36	37.96	.95	6.50	90.00	453
leaba	42	44.20	1.07	6.50	120.00	657
tlgab	48	50.50	1.26	6.50	150.00	947

For Caps, see page 109. P—18



Bushings. All weights are approximate.

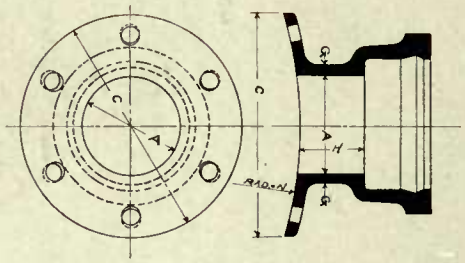


Table No. 99

Hat Flanges. Code Word, **Ifec**

Code Terminal	Size In.	A In.	C In.	G In.	H In.	N In.	Weight Pounds
aca	24 x 6	6	13.50	.43	4	13.0	67
ame	24 x 8	8	15.50	.45	4	13.0	90
allzo	24 x 10	10	17.50	.49	4	13.0	111
aras	24 x 12	12	19.50	.54	4	13.0	149
amus	30 x 6	6	13.50	.43	4	16.0	67
atum	30 x 8	8	15.50	.45	4	16.0	89
acho	30 x 10	10	17.50	.49	4	16.0	110
arll	30 x 12	12	19.50	.54	4	16.0	146
bero	36 x 6	6	13.50	.43	4	19.25	66
blas	36 x 8	8	15.50	.45	4	19.25	88
blam	36 x 10	10	17.50	.49	4	19.25	110
begi	36 x 12	12	19.50	.54	4	19.25	144
blo	42 x 6	6	13.50	.43	4	22.37	66
brom	42 x 8	8	15.50	.45	4	22.37	88
bucu	42 x 10	10	17.50	.49	4	22.37	109
bril	42 x 12	12	19.50	.54	4	22.37	144
eces	48 x 6	6	13.50	.43	4	25.50	66
emur	48 x 8	8	15.50	.45	4	25.50	88
emo	48 x 10	10	17.50	.49	4	25.50	108
ebat	48 x 12	12	19.50	.54	4	25.50	144

Not machined. P—14

Hat Flanges are adapted for connecting small line to large main already in use, or may be used in new work.

Table No. 100

Bushings. Code Word, **Ifid**

Code Terminal	Size In.	A In.	B In.	C In.	H In.	Weight Pounds
atore	6 x 3	4.60	6.65	6.90	4.50	21
ame	6 x 4	5.80	6.65	6.90	4.50	12
avel	8 x 4	5.80	8.80	9.05	4.50	32
acity	8 x 6	7.90	8.80	9.05	4.50	16
arca	10 x 6	7.90	10.85	11.10	4.50	44
abans	10 x 8	10.05	10.85	11.10	4.50	19
aril	12 x 6	7.90	12.95	13.20	5.00	64
bell	12 x 8	10.05	12.95	13.20	5.00	61
bril	12 x 10	12.10	12.95	13.20	5.00	26

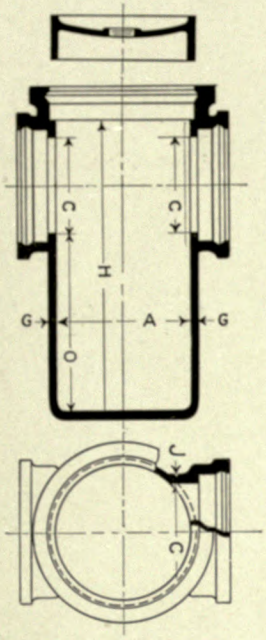
P—10

Standard Special Castings for Gas—Cont.

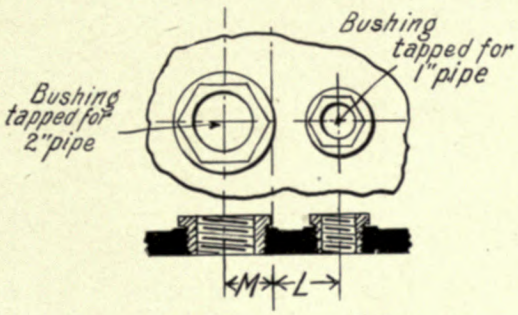
Yard and Holder Drips. Table No. 101

Code Term'l	Size In.	A	C	G	H	J	O	Capacity Quarts	Approx. Wgt., Lbs. Yard Code Ifob	Approx. Wgt., Lbs. Hldr. Code Ifug
aca	4	14	4	.57	55	.40	49.00	129	530	511
ame	6	14	6	.57	55	.43	47.00	124	547	520
atore	8	18	8	.64	55	.45	45.00	204	793	759
avel	10	18	10	.64	55	.49	43.00	185	803	764
area	12	24	12	.76	61	.54	46.81	358	1359	1310
aril	16	30	16	.85	73	.62	54.75	658	2167	2099
beran	20	30	20	.85	73	.68	50.56	609	2210	2120
bril	24	30	24	.85	73	.76	46.38	562	2278	2155
dicort	30	36	30	.95	84	.85	51.38	904	3389	3231
engra	36	42	36	1.07	85	.95	45.38	1087	4438	4282
icula	42	48	42	1.26	91	1.07	45.38	1404	6145	6006
leaba	48	54	48	1.35	91	1.26	39.25	1550	7262	7220

Weights do not include plugs. P—19–20



Yard Drips

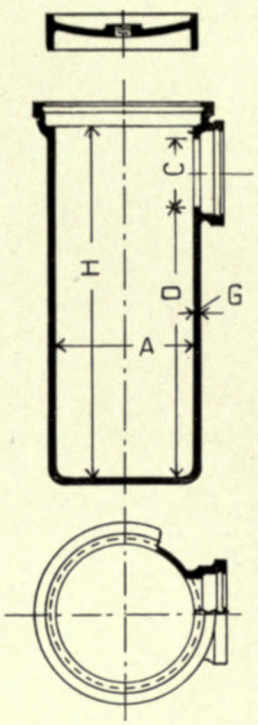


Alternate Tapping of Plugs*

Table No. 102. Code Word, **Igat**

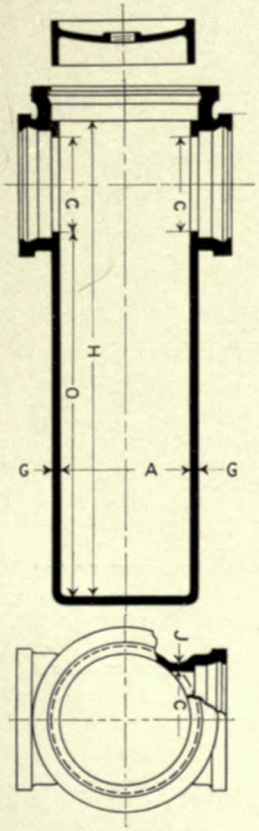
Code Term'l	Size	L	M	Code Term'l	Size	L	M
avela	10	2.75	2.00	**dicort**	30	4.75	4.00
areat	12	2.75	2.00	**engra**	36	4.75	4.00
arila	16	4.75	4.00	**icul**	42	4.75	4.00
beran	20	4.75	4.00	**leab**	48	4.75	4.00
brila	24	4.75	4.00				

*To order only. Bushings extra. P—20



Holder Drips

For yard and holder drips, plugs (see Table No. 98) are supplied with bosses and tapped to order only. They may be arranged with one hole, as shown above drip cuts, or with tapping per Table No. 102.



Line Drips

Line Drips. Table No. 103. Code Word, **Iged**

Code Terminal	Size	A	C	G	H	J	O	Capacity Quarts	Approx. Weight Pounds
acat	4	12	4	.54	19	.40	13.00	24	240
amet	6	12	6	.54	29	.43	21.00	40	310
avet	8	12	8	.54	33	.45	23.00	44	351
aret	10	16	10	.62	37	.49	25.00	83	547
arib	12	16	12	.62	41	.54	26.81	92	615
bera	16	20	16	.68	45	.62	26.75	140	905
bril	20	24	20	.76	49	.68	26.56	209	1276
dicor	24	30	24	.85	53	.76	26.38	320	1851
enga	30	36	30	.95	58	.85	25.38	450	2642
icula	36	42	36	1.07	64	.95	25.38	605	3647
leaber	42	48	42	1.26	71	1.07	25.38	785	5130
	48	54	48	1.35	77	1.26	25.25	980	6408

Weights do not include plugs. See Table No. 98. P—15

Line drips, unless otherwise ordered, are supplied with plugs, having one hole tapped 1¼ inches in a boss about 2½ inches diameter.

All weights are approximate.

Standard Flanged Pipe for Gas

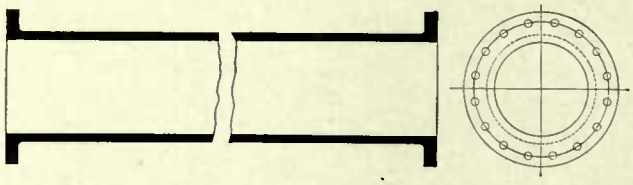


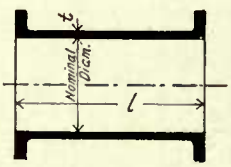
Table No. 104. Code Word, **Igit**

Code Terminal	Nominal Diameter Inches	Thickness Inches	Flange Diameter Inches	Flange Thickness Inches	Diameter Bolt Circle . Inches	No. of Bolts	Size of Bolts Inches	Weight Pounds per		Weight Pounds Single Flange
								Foot	Length	
ame . . .	4	.40	9.00	.72	7.13	4	.625	17.22	224	8.94
atore . . .	6	.43	11.00	.77	9.13	4	.625	27.27	351	12.14
avel . . .	8	.45	13.50	.81	11.13	8	.625	34.94	489	17.38
arca . . .	10	.49	16.00	.86	13.75	8	.625	50.95	659	24.29
aril	12	.54	19.00	.93	15.75	8	.625	67.02	876	36.61
beram . .	16	.62	22.50	1.00	20.00	12	.75	100.38	1296	44.49
bril	20	.68	27.00	1.00	24.50	16	.75	137.72	1766	57.79
dicort . . .	24	.76	31.00	1.13	28.50	16	.75	184.45	2358	73.38
engra . . .	30	.85	37.50	1.25	35.00	20	.875	257.34	3294	104.57
iculo . . .	36	.95	44.00	1.38	41.25	24	.875	344.60	4417	142.31
lien	42	1.07	50.75	1.56	47.75	28	1.00	452.34	5828	201.86
tras . . .	48	1.26	57.00	1.75	54.00	32	1.00	608.02	7801	254.02

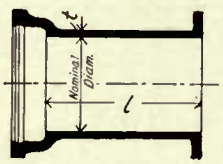
P—75

NOTES—Pipe made in 12-foot lengths and faced $\frac{1}{8}$ inch short for gaskets. All dimensions in inches. Above are neat finished weights. Allowance must be made for variation and finish.

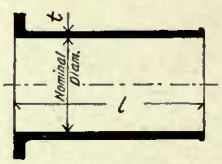
Code, **Igul**



Code, **Ilad**

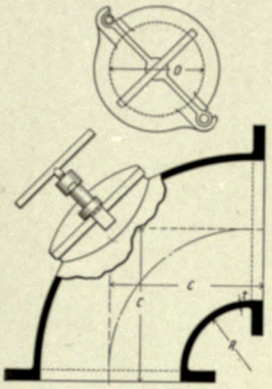


Code, **Ilef**

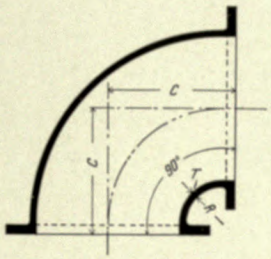


Short sections of flanged pipe for gas with lengths as shown in Tables Nos. 44, 45 and 46, will be furnished for gas with flange and other dimensions, as shown in above table. Use same code terminal as given in Tables Nos. 44, 45 and 46.

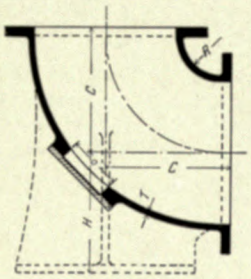
Standard Flanged Castings for Gas

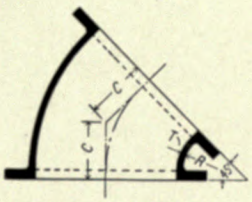


Quick Opening Hand-hole Bends. Code, **Larb**



Flanged ¼ Bends without bolted hand-hole, and with hand-hole or base





Flanged ⅛ Bend

Standard Flanged ¼ Bends. Table No. 105

Code Terminal	Nominal Diameter Inches	C	T	R	H	Approx. Weight, Lbs. Plain Code **Lab**	Hand-hole Code **Lec**	Base Code **Lim**
ame	4	6	.40	2.00	7.00	33	....	46
atore	6	8	.43	3.00	8.00	53	85	75
avel	8	10	.45	3.00	9.25	87	138	119
arca	10	11	.49	4.00	10.50	124	169	175
aril	12	12	.54	4.00	11.00	181	225	253
basse	16	14	.62	4.00	15.25	276	370	411
bucu	20	18	.68	5.00	16.75	450	539	662
deros	24	20	.76	5.00	18.75	642	730	950
etra	30	24	.85	5.00	22.00	1044	1158	1549
igar	36	29	.95	5.50	25.50	1646	1755	2428
lapel	42	32	1.07	5.50	29.00	2366	2471	3520
ocet	48	35	1.26	5.50	33.00	3382	3477	5166

P—78-79

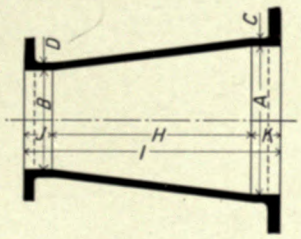
Standard Flanged ⅛ Bends

Table No. 106. Code, **Lod**

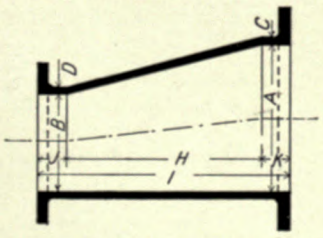
Code Terminal	Nominal Diameter Inches	C	T	R	Approximate Weight Pounds
ame	4	3.42	.40	2.00	27
atore	6	4.23	.43	3.00	42
avel	8	5.63	.45	3.00	69
arca	10	5.44	.49	4.00	92
aril	12	5.82	.54	4.00	135
basse	16	6.62	.62	4.00	193
bucu	20	8.82	.68	5.00	309
deros	24	9.59	.76	5.00	428
etra	30	11.76	.85	5.00	691
igar	36	14.65	.95	5.50	1092
lapel	42	15.83	1.07	5.50	1548
ocet	48	16.97	1.26	5.50	2157

P—80

Hand-holes—0=6 inches on 6 inches, 8 inches on 8 inches to 12 inches inclusive; 12 inches on 16 inches to 24 inches inclusive; 16 inches on 30 inches to 48 inches inclusive. Bends with hand-holes, bolted or quick opening. Extras—Quick opening bends are somewhat heavier than those with bolted covers.



Concentric Reducer. Code, **Luf**



Eccentric Reducers. Code, **Maf**

See Table No. 104 for flange diameters, bolt circles, etc.

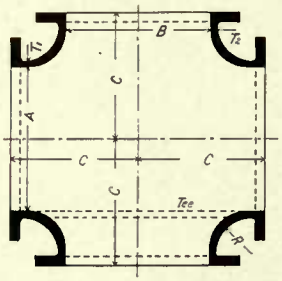
Standard Flanged Reducers. Table No. 107

Code Terminal	Nominal Diam., Inches A	B	Thickness Inches C	D	H	J	K	I	Approx. Weight Pounds
aca	6	4	.43	.40	7.00	2.50	2.50	12.00	43
avel	8	4	.45	.40	15.00	2.50	2.50	20.00	72
ame	8	6	.45	.43	7.00	2.50	2.50	12.00	61
arca	10	4	.49	.40	23.00	2.50	2.50	28.00	113
atur	10	6	.49	.43	15.00	2.50	2.50	20.00	101
atore	10	8	.49	.45	7.00	2.50	2.50	12.00	86
aril	12	6	.54	.43	23.00	3.00	2.50	28.50	159
beran	12	8	.54	.45	15.00	3.00	2.50	20.50	141
bell	12	10	.54	.49	7.00	3.00	2.50	12.50	121
basse	16	8	.62	.45	32.00	3.00	2.50	37.50	275
bara	16	10	.62	.49	24.00	3.00	2.50	29.50	252
bril	16	12	.62	.54	15.00	2.50	2.50	20.00	220
bucu	20	10	.68	.49	40.00	3.00	2.50	45.50	437
bonne	20	12	.68	.54	32.00	2.50	2.50	37.00	408
dicort	20	16	.68	.62	16.00	2.50	2.50	21.00	309
deros	24	16	.76	.62	30.50	3.50	3.00	37.00	554
della	24	20	.76	.68	14.50	3.50	3.00	21.00	410
etra	30	20	.85	.68	39.00	3.50	3.00	45.50	906
etros	30	24	.85	.76	24.00	3.00	3.00	30.00	728
igar	36	24	.95	.76	48.00	3.00	3.00	54.00	1403
icell	36	30	.95	.85	24.00	3.00	3.00	30.00	996
lapel	42	30	1.07	.85	48.00	3.00	3.00	54.00	1899
larel	42	36	1.07	.95	24.00	3.00	3.00	30.00	1337
ocet	48	36	1.26	.95	48.00	3.00	3.00	54.00	2536
omen	48	42	1.26	1.07	24.00	3.00	3.00	30.00	1777

All weights are approximate.

P—81

Standard Flanged Special Castings for Gas



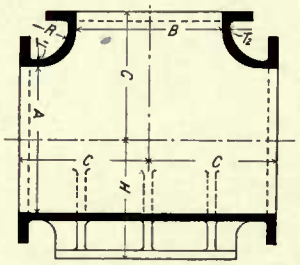
Standard Flanged Tees and Crosses

Table No. 108

See Table No. 104 for Flange Diameters, Bolt Circles, etc.

Code Term'l	Nominal Diameter Inches A	Nominal Diameter Inches B	C	Thickness Inches t_1	Thickness Inches t_2	R	Approx. Weight Pounds Tees Code Meg	Approx. Weight Pounds Crosses Code Mil
ame	4	4	6	.40	.40	2.00	49	63
aras	6	4	8	.43	.40	3.00	79	98
atore	6	6	8	.43	.43	3.00	82	104
atico	8	6	10	.45	.43	3.00	125	155
avel	8	8	10	.45	.45	3.00	130	163
anion	10	6	11	.49	.43	4.00	174	204
anis	10	8	11	.49	.45	4.00	187	232
arca	10	10	11	.49	.49	4.00	192	237
atum	12	8	12	.54	.45	4.00	246	286
acho	12	10	12	.54	.49	4.00	262	317
aril	12	12	12	.54	.54	4.00	269	330
andos	16	10	14	.62	.49	4.00	375	429
barot	16	12	14	.62	.54	4.00	399	476
beran	16	16	14	.62	.62	4.00	396	470
blo	20	12	18	.68	.54	5.00	644	715
buron	20	16	18	.68	.62	5.00	667	809
bril	20	20	18	.68	.68	5.00	653	779
cire	24	16	20	.76	.62	5.00	874	989
deros	24	20	20	.76	.68	5.00	923	1086
dicort	24	24	20	.76	.76	5.00	897	1044
entis	30	20	24	.85	.68	5.00	1393	1556
etra	30	24	24	.85	.76	5.00	1466	1698
engra	30	30	24	.85	.85	5.00	1442	1654
igab	36	24	29	.95	.76	5.50	2171	2291
igar	36	30	29	.95	.85	5.50	2302	2660
iculo	36	36	29	.95	.95	5.50	2272	2606
lard	42	30	32	1.07	.85	5.50	3118	3442
lapel	42	36	32	1.07	.95	5.50	3262	3704
leaba	42	42	32	1.07	1.07	5.50	3193	3585
oltoe	48	36	35	1.26	.95	5.50	4447	4842
ocet	48	42	35	1.26	1.07	5.50	4570	5099
tigab	48	48	35	1.26	1.26	5.50	4544	5041

P—76



Standard Flanged Base Tees

Table No. 109. Code Word, **Mold**

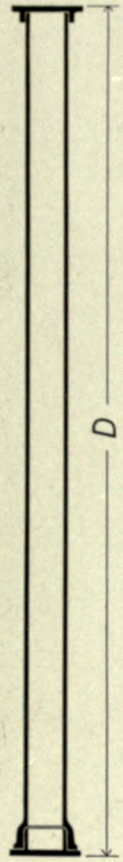
See Table No. 104 for Flange Diameters, Bolt Circles, etc.

Code Term'l	Nom'l Diam., In. A	Nom'l Diam., In. B	C	Thickness Inches t_1	Thickness Inches t_2	R	H	Approx. Weight Pounds
ame	4	4	6	.40	.40	2.00	7.00	63
aras	6	4	8	.43	.40	3.00	8.00	103
atore	6	6	8	.43	.43	3.00	8.00	106
atico	8	6	10	.45	.43	3.00	9.25	161
avel	8	8	10	.45	.45	3.00	9.25	168
anion	10	6	11	.49	.43	4.00	10.50	230
anis	10	8	11	.49	.45	4.00	10.50	243
arca	10	10	11	.49	.49	4.00	10.50	248
atum	12	8	12	.54	.45	4.00	11.00	323
acho	12	10	12	.54	.49	4.00	11.00	339
avil	12	12	12	.54	.54	4.00	11.00	346
andos	16	10	14	.62	.49	4.00	15.25	528
barot	16	12	14	.62	.54	4.00	15.25	552
beran	16	16	14	.62	.62	4.00	15.25	549
blo	20	12	18	.68	.54	5.00	16.75	870
buron	20	16	18	.68	.62	5.00	16.75	894
bril	20	20	18	.68	.68	5.00	16.75	880
cire	24	16	20	.76	.62	5.00	18.75	1203
deros	24	20	20	.76	.68	5.00	18.75	1252
dicort	24	24	20	.76	.76	5.00	18.75	1226
entis	30	20	24	.85	.68	5.00	22.00	1921
etra	30	24	24	.85	.76	5.00	22.00	1994
engra	30	30	24	.85	.85	5.00	22.00	1970
igab	36	24	29	.95	.76	5.50	25.50	2979
igar	36	30	29	.95	.85	5.50	25.50	3110
iculo	36	36	29	.95	.95	5.50	25.50	3080
lard	42	30	32	1.07	.85	5.50	29.00	4309
lapel	42	36	32	1.07	.95	5.50	29.00	4453
leaba	42	42	32	1.07	1.07	5.50	29.00	4384
oltoe	48	36	35	1.26	.95	5.50	33.00	6272
ocet	48	42	35	1.26	1.07	5.50	33.00	6395
tigab	48	48	35	1.26	1.26	5.50	33.00	6379

All weights are approximate.

P—77

Cast Iron Pipe Columns. Table No. 110



Code Terminal for Length	D	4-Inch Pipe Code Word, **Mone** Base and Top Casting, 10 Inches Square, Weight 65 Pounds		6-Inch Pipe Code Word, **Mopa** Base and Top Casting, 12 Inches Square, Weight 100 Pounds		8-Inch Pipe Code Word, **Mulo** Base and Top Casting, 14 Inches Square, Weight 145 Pounds		10-Inch Pipe Code Word, **Mumi** Base and Top Casting, 16 Inches Square, Weight 200 Pounds	
		Wght.	Load	Wght.	Load	Wght.	Load	Wght.	Load
cions	6′—0″	160	56070	245	100100	359	164410	428	224200
cure	6′—6″	171	54130	262	98310	385	162400	464	222300
jaison	7′—0″	183	52190	280	96270	410	160350	500	220300
jarius	7′—6″	194	50250	298	94100	436	158200	535	218300
dation	8′—0″	206	48320	316	92040	462	156000	571	216200
dator	8′—6″	217	46440	333	89820	487	153600	607	213900
dear	9′—0″	229	44590	351	87620	513	151200	643	211600
debit	9′—6″	240	42800	368	85450	539	148760	678	209300
demus	10′—0″	251	41050	386	83260	564	146260	714	206900
descas	10′—6″	262	39360	404	81040	590	143700	750	204500
sbalg	11′—0″	274	37730	421	78840	615	141160	785	202200
sig	11′—6″	285	36160	439	76700	642	138570	821	199800
sloch	12′—0″	297	34670	457	74580	667	135920	857	197400
smuff	12′—6″	308	33220	474	71600	692	133340	893	195000

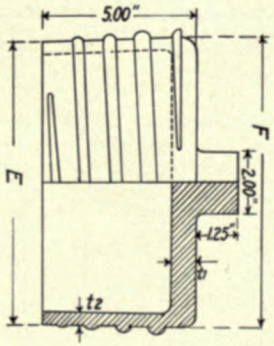
Add weight of base and top castings for complete weight of column. Load based on Gordon's formula. Factor of safety, 8. Ends of pipe are machined. Tops and bases furnished without bolt holes unless otherwise ordered. When required, top and base castings arranged with central holes for long bolt for tying to floors or roof.

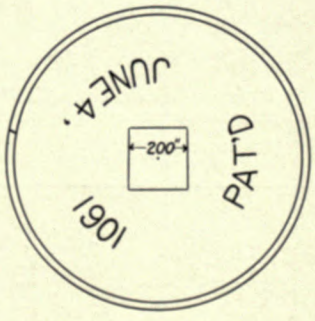
Standard Screw Plugs for Gas and Water Mains

(Patented June 4, 1901)

Table No. 111. Code Word, **Myrt**

Code Terminal	Size	Weight, Pounds
alon	3	7
ame	4	10
atore	6	18
avel	8	26
arca	10	43
aril	12	56





All weights are approximate.

Capacity of Cast Iron Pipe

Table of contents in cubic feet and United States gallons, and weight of water (at 62½ pounds per cubic foot) contained in one foot lengths of different internal diameters of pipe, and square root of diameter in feet

Diameter in Inches	Diameter in Feet	United States Gallons of 231 Cubic Inches	Weight of Water Pounds	Square Root of Diameter in Feet	Diameter in Inches	Diameter in Feet	United States Gallons of 231 Cubic Inches	Weight of Water Pounds	Square Root of Diameter in Feet
1	.0833	.0408	.3395	.289	25	2.083	25.50	212.20	1.443
2	.1667	.1632	1.358	.408	26	2.167	27.58	229.51	1.472
3	.2500	.3672	3.055	.500	27	2.250	29.74	247.51	1.500
4	.3333	.6528	5.432	.579	28	2.333	31.99	266.18	1.528
5	.4167	1.020	8.488	.645	29	2.417	34.31	285.53	1.555
6	.5000	1.469	12.223	.707	30	2.500	36.72	305.57	1.581
7	.5833	1.999	16.636	.764	31	2.583	39.21	326.27	1.607
8	.6667	2.611	21.729	.817	32	2.667	41.78	347.66	1.633
9	.7500	3.305	27.501	.866	33	2.750	44.43	369.74	1.658
10	.8333	4.080	33.952	.913	34	2.833	47.16	392.48	1.683
11	.9167	4.937	41.082	.957	35	2.917	49.98	415.90	1.708
12	1.	5.875	48.891	1.000	36	3.	52.88	440.00	1.732
13	1.083	6.895	57.379	1.041	37	3.083	55.86	464.80	1.756
14	1.167	7.997	66.545	1.080	38	3.167	58.92	490.24	1.779
15	1.250	9.180	76.392	1.118	39	3.250	62.06	516.40	1.803
16	1.333	10.44	86.916	1.155	40	3.333	65.28	543.24	1.825
17	1.417	11.79	98.121	1.190	41	3.417	68.58	570.72	1.849
18	1.500	13.22	110.	1.224	42	3.500	71.97	598.92	1.871
19	1.583	14.73	122.56	1.258	43	3.583	75.44	627.81	1.894
20	1.667	16.32	135.81	1.291	44	3.667	78.99	657.32	1.915
21	1.750	17.99	149.73	1.323	45	3.750	82.62	687.56	1.937
22	1.833	19.75	164.33	1.354	46	3.833	86.33	718.40	1.958
23	1.917	21.58	179.60	1.384	47	3.917	90.13	750.06	1.979
24	2.	23.50	195.56	1.414	48	4.	94.00	782.24	2.000

For larger diameters than those given, take one-half the size required from the table, and multiply by 4; so also with gallons and weights.

Capacity of Cisterns

Capacity of Cisterns of different diameters and different depths in United States gallons, 231 cubic inches

Diameter Feet	Depth, Feet	United States Gallons, 231 Cubic Inches	Cubic Feet	Diameter Feet	Depth, Feet	United States Gallons, 231 Cubic Inches	Cubic Feet
12	8	6769	905	24	12	40607	5429
14	9	10359	1385	26	13	51628	6902
16	9	13535	1810	28	14	64481	8621
18	10	19034	2545	30	15	79310	10603
20	10	23499	3142	32	16	96253	12868
22	11	31277	4181	34	17	115451	15435

Frictional Heads at Given Rates of Discharge in Clean Cast Iron Pipes for Each 1,000 Feet of Length

U. S. Gallons Discharged per Minute	U. S. Gallons Discharged per Twenty-four Hours	4-inch Pipe			6-inch Pipe			8-inch Pipe			10-inch Pipe			12-inch Pipe			14-inch Pipe		
		Velocity in Feet	Fric. Head		Velocity in Feet	Fric. Head		Velocity in Feet	Fric. Head		Velocity in Feet	Fric. Head		Velocity in Feet	Fric. Head		Velocity in Feet	Fric. Head	
			Feet	Lbs.		Feet	Lbs.		Feet	Lbs.		Feet	Lbs.		Feet	Lbs.		Feet	Lbs.
25	36,000	.64	.59	.26	.28	.11	.05	.16	.04	.02	.10	.02	.01	.07	.01				
50	72,000	1.28	2.01	.87	.57	.32	.14	.32	.10	.04	.20	.04	.02	.14	.02	.01	.10	.01	
100	144,000	2.55	7.36	3.19	1.13	1.08	.47	.64	.29	.13	.41	.11	.05	.28	.05	.02	.21	.03	.01
150	216,000	3.83	16.05	6.95	1.70	2.28	.99	.96	.60	.26	.61	.22	.10	.43	.10	.04	.31	.05	.02
200	288,000	5.11	28.09	12.17	2.27	3.92	1.70	1.28	1.01	.44	.82	.36	.16	.57	.16	.07	.42	.08	.04
250	360,000	6.37	43.47	18.83	2.84	6.00	2.60	1.60	1.52	.66	1.02	.54	.23	.71	.24	.10	.52	.12	.05
300	432,000	7.66	62.20	26.94	3.40	8.52	3.69	1.91	2.13	.92	1.23	.75	.32	.85	.32	.14	.63	.16	.07
350	504,000	8.91	84.26	36.50	3.97	11.48	4.97	2.23	2.85	1.24	1.43	.99	.43	.99	.43	.18	.73	.21	.09
400	576,000	10.21	109.68	47.50	4.54	14.89	6.45	2.55	3.68	1.59	1.63	1.27	.55	1.13	.54	.23	.83	.27	.12
450	648,000	11.49	138.43	59.96	5.11	18.73	8.11	2.87	4.61	2.00	1.83	1.58	.69	1.28	.67	.29	.94	.33	.14
500	720,000	12.77	170.53	73.87	5.67	23.01	9.97	3.19	5.64	2.44	2.04	1.93	.84	1.42	.81	.35	1.04	.40	.17
600	864,000	15.32	244.76	106.02	6.81	32.89	14.25	3.83	8.03	3.48	2.45	2.72	1.18	1.70	1.14	.49	1.25	.55	.24
700	1,008,000	17.87	332.36	143.98	7.94	44.54	19.08	4.47	10.83	4.69	2.86	3.66	1.58	1.98	1.52	.66	1.46	.73	.32
800	1,152,000	.....	.....	.....	9.08	57.95	25.10	5.09	14.05	6.08	3.27	4.73	2.05	2.27	1.96	.85	1.67	.94	.41
900	1,296,000	.....	.....	.....	10.21	73.12	31.67	5.74	17.68	7.69	3.68	5.93	2.57	2.55	2.45	1.06	1.88	1.17	.51
1,000	1,440,000	.....	.....	.....	11.35	90.05	38.99	6.38	21.74	9.41	4.08	7.28	3.15	2.84	3.00	1.30	2.08	1.43	.62
1,200	1,728 000	.....	.....	.....	13.61	129.20	55.96	7.66	31.10	13.47	4.90	10.38	4.50	3.40	4.26	1.85	2.50	2.02	.88
1,400	2,016,000	.....	.....	.....	15.88	175.38	75.97	8.94	42.13	18.25	5.72	14.02	6.07	3.97	5.74	2.49	2.91	2.72	1.18
1,600	2,304,000	.....	.....	.....	18.15	228.62	99.03	10.21	54.84	23.75	6.53	18.22	7.89	4.54	7.44	3.22	3.33	3.51	1.52
1,800	2,592,000	.....	.....	.....	20.42	288.90	125.14	11.47	69.22	29.98	7.35	22.96	9.95	5.11	9.36	4.06	3.75	4.41	1.91
2,000	2,880,000	.....	.....	.....	22.69	356.22	154.30	12.77	85.27	36.93	8.17	28.25	12.34	5.67	11.50	5.00	4.17	5.41	2.34
2,500	3,600,000	.....	.....	.....	.....	.....	.....	15.96	132.70	57.49	10.21	43.87	19.00	7.09	17.82	7.72	5.21	8.35	3.62
3,000	4,320,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	12.25	62.92	27.25	8.51	25.51	11.05	6.25	11.92	5.17
3,500	5,040,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9.93	34.58	14.98	7.29	16.14	6.99
4,000	5,760,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8.34	21.00	9.10
4,500	6,480,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9.38	26.49	11.47

		16-inch Pipe			18-inch Pipe			20-inch Pipe			24-inch Pipe			30-inch Pipe			36-inch Pipe		
500	720,000	.80	.22	.09	.63	.13	.06	.51	.08	.04	.35	.04	.02	.23	.01	.00	.16	.01	.00
1,000	1,440,000	1.60	.76	.34	1.26	.44	.19	1.02	.27	.12	.71	.12	.05	.45	.04	.02	.32	.02	.01
1,500	2,160,000	2.39	1.63	.71	1.89	.93	.40	1.53	.56	.24	1.06	.24	.10	.68	.09	.04	.47	.04	.02
2,000	2,880,000	3.19	2.82	1.22	2.52	1.60	.69	2.04	.96	.42	1.42	.41	.18	.91	.15	.06	.63	.06	.03
2,500	3,600,000	3.99	4.34	1.88	3.15	2.45	1.06	2.55	1.47	.64	1.77	.62	.27	1.13	.22	.09	.79	.09	.04
3,000	4,320,000	4.79	6.19	2.68	3.78	3.48	1.51	3.06	2.09	.90	2.13	.87	.38	1.36	.30	.13	.95	.13	.06
3,500	5,040,000	5.59	8.37	3.63	4.41	4.70	2.03	3.57	2.81	1.22	2.48	1.16	.50	1.59	.40	.17	1.10	.17	.07
4,000	5,760,000	6.38	10.87	4.71	5.04	6.09	2.64	4.08	3.64	1.58	2.84	1.50	.65	1.82	.52	.22	1.26	.22	.09
4,500	6,480,000	7.18	13.70	5.93	5.67	7.67	3.32	4.59	4.58	1.98	3.19	1.88	.82	2.04	.64	.28	1.42	.27	.12
5,000	7,200,000	7.98	16.85	7.30	6.30	9.43	4.08	5.11	5.62	2.43	3.55	2.31	1.00	2.27	.78	.34	1.58	.33	.14
5,500	7,920,000	8.78	20.33	8.71	6.93	11.38	4.92	5.62	6.77	2.93	3.90	2.77	1.20	2.50	.94	.41	1.73	.39	.17
6,000	8,640,000	....	.....	....	7.57	13.49	5.84	6.13	8.03	3.48	4.26	3.28	1.42	2.72	1.11	.48	1.89	.46	.20
7,000	10,080.000	....	.....	....	....	.....	....	7.15	10.86	4.71	4.96	4.43	1.92	3.18	1.49	.65	2.21	.62	.27
8,000	11,520,000	....	.....	....	....	.....	....	....	.....	....	5.67	5.75	2.49	3.63	1.93	.84	2.52	.80	.35
9,000	12,960,000	....	.....	....	....	.....	....	....	.....	....	6.38	7.25	3.14	4.08	2.43	1.05	2.84	1.00	.43
10,000	14,400,000	....	.....	....	....	.....	....	....	.....	....	....	....	....	4.54	2.98	1.29	3.15	1.23	.53
11,000	15,840,000	....	.....	....	....	.....	....	....	.....	....	....	....	....	5.00	3.59	1.55	3.46	1.47	.64
12,000	17,280,000	....	.....	....	....	.....	....	....	.....	....	....	....	....	5.44	4.25	1.84	3.78	1.74	.75
13,000	18,720,000	....	.....	....	....	.....	....	....	.....	....	....	....	....	5.90	4.97	2.15	4.09	2.03	.88
14,000	20,160,000	....	.....	....	....	.....	....	....	.....	....	....	....	....	6.36	5.75	2.49	4.41	2.35	1.02
15,000	21,600,000	....	.....	....	....	.....	....	....	.....	....	....	....	....	6.80	6.58	2.85	4.73	2.69	1.17
16,000	23,040,000	....	.....	....	....	.....	....	....	.....	....	....	....	....	....	....	....	5.05	3.04	1.32
17,000	24,480,000	....	.....	....	....	.....	....	....	.....	....	....	....	....	....	....	....	5.36	3.43	1.49
18,000	25,920,000	....	.....	....	....	.....	....	....	.....	....	....	....	....	....	....	....	5.68	3.83	1.66
20,000	28,800,000	....	.....	....	....	.....	....	....	.....	....	....	....	....	....	....	....	6.30	4.71	2.04

See text on page following.

The application of this table is fourfold. It may be used to ascertain the *maximum discharging capacity* of a pipe under a given head, or to ascertain the *diameter* of a *pipe* for a given discharge and head. It may also be used to ascertain *loss of pressure* for a given rate of discharge, or to determine the *volume* of water *flowing* through a pipe from the reduction of pressure. Velocity and entrance head are not included in the figures for frictional head and may be omitted for ordinary mains, but should be added for high velocity. Discharge and velocity will be affected somewhat by the condition of the mains, number of specials and valves in the line, etc.

As an example of the *maximum quantity* of water an 8-inch pipe will discharge, take 7,500 feet of 8-inch straight cast iron pipe, under a head of 160 feet, which, divided by 7.5, gives 21.33 as the frictional head per 1,000 feet of pipe. The table shows 1,000 feet of 8-inch pipe under 21.74 feet head will give a flow of approximately 1,000 United States gallons per minute.

To ascertain the *diameter* of *pipe* for a given flow, we may take as an example a delivery of 1,900,000 gallons in twenty-four hours through a line of pipe 25,000 feet in length, under pressure due to 150 feet head, from which we figure a frictional resistance of 6 feet per 1,000 feet of pipe. By reference to the table, we find that under a frictional head of 5.74 feet per 1,000 feet, a line of 12-inch pipe will discharge 2,016,000 gallons in twenty-four hours, which approximates the desired delivery close enough for ordinary use.

If we would ascertain the extra work or *loss* due to friction in a line of pipe, we must know the diameter, flow and head pumped against. Take a 10-inch line, 4,000 feet long, which is delivering 900 gallons of water per minute at a point 100 feet above the pump. By reference to the table, we find the frictional head per 1,000 feet of 10-inch pipe delivering 900 gallons per minute is 5.93 feet or 23.72 feet loss due to friction for 4,000 feet of pipe; so that the pump must work against a pressure due to 123.72 feet head.

The *quantity* of water *flowing* may be determined by noting the loss of pressure per 1,000 feet of pipe. Thus, allowing for difference in level, if the frictional loss be 2½ pounds in 1,000 feet of 10-inch line, we find by the table the flow is 900 gallons per minute. If this frictional loss amounted to 1½ pounds we would have a flow of 700 gallons per minute.

Friction Heads for Elbows

Heads required to overcome the resistance of ninety-degree circular bends

Velocity in Feet per Second	Radius of Bend in Diameters of Pipe							
	0.5	0.75	1.00	1.25	1.5	2.0	3.0	5.0
	Head, in Feet							
1	.016	.005	.002	.002	.001	.001	.001	.001
2	.062	.018	.009	.007	.005	.005	.004	.004
3	.140	.041	.020	.015	.012	.011	.010	.009
4	.224	.072	.036	.026	.021	.019	.017	.016
5	.388	.113	.056	.041	.033	.029	.027	.025
6	.559	.162	.081	.059	.048	.042	.038	.036
7	.761	.221	.110	.080	.066	.057	.052	.050
8	.994	.288	.114	.104	.086	.074	.069	.065
9	1.260	.365	.182	.132	.108	.094	.086	.082
10	1.550	.450	.225	.163	.134	.116	.106	.101
12	2.340	.649	.324	.236	.192	.167	.153	.145

The above table has been calculated by the well known Weisbach formula, for pipe or bends of circular cross section, i.e., round water pipe specials.

Let R = radius of curve or bend in inches
r = radius of section of pipe in inches
K = coefficient of resistance
v = velocity of flow in feet per second
a° = angle embraced by curve or bend (a right angle bend = 90°)
h = friction head in feet or decimal of foot
g = acceleration due to gravity = 32.2

Then $$K = 0.131 + 1.847 \left(\frac{r}{R}\right)^{\frac{7}{2}}$$

And $$h = K \frac{v^2}{2g} \times \frac{a^\circ}{180}$$

Suppose a 90° bend of circular cross section, 20 inches diameter (r = 10) and 25 inches radius of curvature (= R.) what friction head is developed by a velocity of flow of 27,896 feet per second?

$$K = 0.131 + 1.847 \left(\frac{10}{25}\right)^{\frac{7}{2}} = 0.206$$

And $$h. = .206 \frac{2{,}7896^2}{64.4} \times \frac{90}{180} = 0.01245 \text{ feet}$$

Motion of Gas in Pipe

The following tables are computed by the formula given below, in which

Q = Quantity of gas in cubic feet per hour.
L = Length of pipe in yards lineal.
D = Diameter of pipe in inches.
H = Head of water pressure in inches.
G = Specific gravity of gas = .400.

$$Q = 1350\, D^2 \sqrt{\frac{H\,D}{G\,L}}$$

$$D = .056^5 \sqrt{\frac{Q^2\,G\,L}{H}}$$

If it is desired to ascertain the quantities discharged of gas of any other specific gravity, multiply the quantities indicated in the following tables by the square root of .4, and divide the product by the square root of the specific gravity of the other gas.

If the length of the pipe is one-fourth of the lengths given in the table, the discharge of gas will be doubled.

If the length of the pipe is four times greater than the lengths in the table, the discharge of gas will be only one-half.

Four times the pressure doubles the discharge of gas.

Table Showing the Discharge of Gas in Cubic Feet per Hour, through Pipe of Different Diameters and Various Lengths in Yards Lineal

Pressure of Water in Inches, 1, 1.5, 2, 2.5. Specific Gravity, .400

Length in Yards	4 Inches Diameter				Length in Yards	6 Inches Diameter			
	1	1.5	2	2.5		1	1.5	2	2.5
100	6,831	8,370	9,658	10,800	100	18,820	23,050	26,600	29,770
150	5,580	6,830	7,888	8,817	150	15,370	18,820	21,700	24,300
200	4,829	5,920	6,826	7,674	200	13,310	16,400	18,800	21,000
300	3,944	4,829	5,577	6,233	300	10,870	13,310	15,370	17,180
500	3,055	3,740	4,320	4,829	500	8,418	10,310	11,940	13,310
750	2,420	3,055	3,522	3,944	750	6,872	8,418	9,720	10,870
1,000	2,160	2,646	3,052	3,413	1,000	5,950	7,290	8,420	9,410
1,250	1,932	2,366	2,732	3,052	1,250	5,340	6,320	7,540	8,415
1,500	1,761	2,160	2,490	2,789	1,500	4,860	5,970	6,860	7,672
1,750	1,634	2,000	2,310	2,582	1,750	4,500	5,500	6,366	7,115
2,000	1,530	1,870	2,150	2,415	2,000	4,209	5,155	5,970	6,655

Table Showing the Discharge of Gas in Cubic Feet per Hour, through Pipe of Different Diameters and Various Lengths in Yards Lineal Pressure of Water in Inches, 1, 1.5, 2, 2.5. Specific Gravity, .400—Continued

Length in Yards	8 Inches Diameter				Length in Yards	10 Inches Diameter			
	1	1.5	2	2.5		1	1.5	2	2.5
100	38,650	47,350	54,640	61,100	500	30,100	37,100	42,600	47,700
150	31,550	38,640	44,600	49,940	750	24,650	30,190	34,800	39,000
200	27,340	33,460	38,600	43,200	1,000	21,640	26,150	30,100	33,750
300	22,310	27,340	31,550	35,270	1,500	17,400	21,300	24,760	27,560
500	17,280	21,170	24,400	27,340	2,000	15,050	18,500	21,300	23,850
750	14,100	17,280	19,800	22,310	2,500	13,175	16,136	18,632	20,880
1,000	12,220	14,960	17,280	19,320	3,000	12,027	14,561	17,008	19,016
1,250	10,940	13,650	15,520	17,280	4,000	10,413	12,756	14,729	16,468
1,500	9,900	12,200	14,040	15,800					
1,750	9,237	11,300	13,040	14,600					
2,000	8,640	10,585	12,200	13,670					

Length in Yards	12 Inches Diameter				Length in Yards	16 Inches Diameter			
	1	1.5	2	2.5		1	1.5	2	2.5
500	47,600	58,320	67,200	75,240	500	98,000	120,200	138,240	154,560
750	38,800	47,600	55,000	61,470	750	79,770	97,740	113,200	128,020
1,000	33,660	41,200	47,600	53,240	1,000	69,120	84,670	98,000	109,260
1,500	27,500	33,600	38,880	43,515	1,500	56,600	69,120	79,800	89,230
2,000	23,800	29,250	33,600	37,620	2,000	49,000	60,100	69,120	77,280
2,500	21,190	26,100	30,116	33,631	2,500	43,680	53,540	61,824	69,120
3,000	19,440	23,800	27,500	30,740	3,000	39,885	48,870	56,600	64,000
4,000	16,830	20,600	23,800	26,620	4,000	34,560	42,340	49,000	54,630

Table Showing the Discharge of Gas in Cubic Feet per Hour, through Pipe of Different Diameters and Various Lengths in Yards Lineal

Pressure of Water in Inches, 1, 1.5, 2, 2.5. Specific Gravity, .400—Continued

Length in Yards	20 Inches Diameter				Length in Yards	24 Inches Diameter			
	1	1.5	2	2.5		1	1.5	2	2.5
500	170,600	204,600	241,000	270,000	500	271,200	326,000	375,000	425,800
750	139,600	170,600	197,600	222,400	750	217,200	271,200	310,000	344,000
1,000	120,744	147,900	170,600	191,000	1,000	189,200	233,280	271,200	301,160
1,500	98,800	120,700	139,600	155,800	1,500	155,000	190,500	217,200	245,800
2,000	85,300	102,300	124,500	135,000	2,000	135,600	163,000	187,600	212,900
2,500	76,500	93,500	108,000	120,744	2,500	119,000	145,500	168,000	194,400
3,000	69,800	85,300	98,800	110,200	3,000	108,600	135,600	155,000	172,000
4,000	60,370	73,950	85,300	95,500	4,000	95,350	116,640	135,600	150,580

Length in Yards	30 Inches Diameter				Length in Yards	36 Inches Diameter			
	1	1.5	2	2.5		1	1.5	2	2.5
500	468,000	574,000	664,000	744,200	500	744,000	912,000	121,200	1,256,400
750	384,000	468,000	558,900	607,600	750	606,000	744,000	856,000	1,032,000
1,000	332,000	406,000	468,000	526,000	1,000	530,000	644,000	744,000	832,000
1,500	272,070	332,760	384,140	457,600	1,500	428,500	524,860	606,000	677,630
2,000	234,000	287,000	332,000	372,100	2,000	372,000	456,000	524,880	628,200
2,500	210,000	257,000	298,000	332,000	2,500	332,000	408,000	468,000	530,000
3,000	292,000	234,000	270,000	303,800	3,000	303,000	372,000	428,000	516,000
4,000	166,000	203,000	234,000	263,000	4,000	265,000	322,000	372,000	416,000

Code

For sizes, dimensions, weights, see table, pages 138, 139, 140.
For quantities in lengths, feet, net tons, see table, pages 138, 139, 140.
For shipments, see pages 134, 135, 136. Dates, see page 137.
For telegrams, letters, invoices, etc., see pages 131, 132–137.
For orders, see page 133.

Inquiries

Nachbacken	Quote by mail
Nachbar	Quote by mail to reach here by
Nachbarin	Quote by mail in care of
Nachbarweg	Quote by wire
Nachbefehl	Quote by wire to reach here by
Nachbehelf	Quote by wire in care of
Nachbeizen	Quote on dock
Nachbild	Quote alongside dock
Nachbilden	Quote alongside vessel
Nachobhren	Quote f. o. b. this city
Nachdem	How soon can you furnish
Nachdenken	How soon can you furnish and at what price
Nachdruck	How soon can you furnish and at what price delivered f. o. b.
Nacheifern	Will you renew offer of
Nachen	Will you extend time for acceptance of your offer to
Nachfahren	Will you extend option for one day
Nachfeier	Will you extend option for two days
Nachfolgen	Will you extend option for three days
Nachform	Will you extend option for four days
Nachfragen	Will you extend option for five days
Nachfrucht	Will you extend option for seven days
Nachfuegen	Will you extend option for ten days
Nachgaffen	Have you in stock
Nachgeben	Have you in stock, if not, how long will it take you to make
Nachgeholt	How much of the following have you in stock
Nachgekaut	How much of the following have you in stock, and when can you ship balance
Nachgellen	When can you make
Nachgenuss	When can you make per your specifications
Nachgerade	How long after receiving order will it take you to make

Inquiries—Continued

Nachgiebig . Can you furnish at
Nachgluth . Please send more definite information
Nachgrasen . Please send more definite information in reference to
Nachgucken . Please specify sizes, weights and quantities wanted
Nachguss . . Can you obtain any information from
Nachhall . . Can you obtain any information
Nachhauen . Can you obtain any information concerning
Nachheften . Have your representative call regarding pipe inquired for
Nachherbst . Have your representative call regarding pipe inquired for on or before
Nachhobeln . Mail me copy your specifications
Nachholen . Mail copy your specifications to
Nachhuelfe . Mail me copy your catalogue
Nachjagen . Mail copy your catalogue to
Nachjahr . . This price is desired for estimate

Answers to Inquiries

Subject to strikes, accidents and other causes beyond our control. Any casting developing an inherent defect when placed in service will be replaced f. o. b. agreed point of delivery. No claims for damages allowed. Price subject to change without notice in one week.

Narrabamus . We quote, subject to above clause, on
Narraban . . We quote, subject to above clause, f. o. b.
Narrabitis . We quote, subject to above clause, f. o. b. our works
Narradora . We quote, subject to above clause, f. o. b. our works for shipment to
Narragione . We quote, subject to above clause, for export
Narrais . . We quote, subject to above clause, for export to
Narramus . We quote, subject to above clause, on dock
Narrandos . We quote, subject to above clause, alongside dock
Narrantium . We quote, subject to above clause, alongside vessel
Narrarem . . We quote, subject to above clause, f. o. b. this city
Narrarono . We are quoting by mail
Narrasemos . We are quoting by mail to reach you by
Narrasses . . We are quoting by mail in care of
Narrassiez . We suggest you quote
Narrassimo . We can make
Narrateur . . We can make per our specifications
Narrations . We can make material specified by you
Narrativi . . We can make material specified by you from our standard specifications
Narrativos . We cannot make
Narrativum . We cannot make material specified by you
Narratore . . We have in stock
Narratorio . We have none in stock
Narratrice . Of the material specified by you, we have in stock
Narraturi . . Of the material specified by you, we have part in stock and can ship balance
Narraturos . Engagements prevent our making material
Narraturum . Engagements prevent our making material specified by you
Narravimus . Engagements prevent our making material specified by you before
Narravisti . We will renew offer for
Narravit . . We will extend time for acceptance of our offer to
Narren . . We will extend option for one day
Narrenader . We will extend option for two days
Narrenbel . . We will extend option for three days
Narrenfest . We will extend option for four days
Narrenhaus . We will extend option for five days

Answers to Inquiries—Continued

Narrenkap	We will extend option for seven days
Narrenkopf	We will extend option for ten days
Narrenkuur	We cannot furnish at
Narrenlust	We cannot furnish for less than
Narrenpak	We will make delivery
Narrenpots	We will get more definite information
Narrenrede	We will get more definite information concerning
Narrenseil	We will get more definite information and advise
Narrentanz	We are mailing copy our specifications
Narrenthum	We are mailing copy our specifications to
Narrenwelt	We are mailing copy our catalogue
Narrenwort	We are mailing copy our catalogue to
Narrenzeit	Our representative will call
Narrenzeug	Our representative will call on
Narrerais	Our representative unable to reach you as requested, will call
Narreremo	Our representative unavoidably detained, will call

Telegrams

Natabamus . See our telegram
Natabat . . See our telegram of
Natabilite . See your telegram of
Natabilium . . Have not received your telegram
Natabulum . Answering your telegram
Natabundi . Answering your telegram of
Natabundos . Answering your telegram of even date
Natafelen . . Without answer to our telegram
Natale . . . Without answer to our telegram of
Natalia . . Telegraph answer
Natalibus . . Telegraph answer to
Natalicios . . Telegraph answer in care of
Natalicium . We do not understand your telegram
Natalities . . There is a mistake in our telegram, it should read
Natalizio . . Telegram came too late
Nataloine . . Telegram received, will advise upon hearing from
Natant . . . Telegram received, will advise upon hearing from works
Natantes . . Telegram received, will advise upon securing freights
Natantium . Telegram received, we are working upon this and will advise
Natantly . . Telegraph briefly, sending full particulars by mail

Letters

Nascamini . We are writing
Nascebamur . We have written
Nascedouro . We will write
Nascemmo . Answering your letter
Nascenca . . Answering your letter of
Nascendo . . Answering your letter of even date
Nascent . . Your letter received
Nasceranno . Have not received your letter
Nascerebbe . See our letter
Nascevamo . See our letter of
Nascevate . See your letter
Naschdose . See your letter of
Naschelden . Send answer
Naschhaft . Send answer to
Naschijnen . Send answer in care of
Naschimpen . We do not understand your letter
Naschkatze . We do not understand your letter, advise us
Naschmarkt . Write full particulars
Naschmaul . Explanatory letter following
Naschoppen . Will write advising further
Naschouw . Answering your letter, we are working upon this and will advise
Naschouwen . There is a mistake in our letter, it should read
Naschrift . . Our letter missent
Naschsucht . Our letter missent, mailing copy to-day
Naschudden . Letters came too late

Orders

Naticier . . Enter order for
Naticoide . . Enter order per your quotation
Naticuto . . Enter order for shipment within
Natifs . . . Enter order for shipment to
Natiguay . . Have you received order without acknowledgments
Natijd . . . Revise order to read
Natillas . . Advise by wire if order has been entered
Natimmeren . We are mailing confirming order
Natinabor . Our order in error. Await to-day's order
Natinantem . Will you increase order at same price
Natinantis . Have not received
Natinemur . Have not received order from you
Natinor . . Have not received order from you for
Nation . . . Telegram received, have revised order to read as you direct
Nationum . Letter received, have revised order to read as you direct
Native . . . Will enter order
Nativement . Will enter order per quotation of
Nativeness . We will increase order at same price
Natividade . We will not increase order at same price

Shipments

All references to time relate to time of shipment from works.

Inquiries		Answers	
Nava . . .	Can you ship	**Nea**	We can ship
Nawi . . .	Please ship	**Nebe** . . .	We will ship
Naxe . . .	Do not ship	**Neca** . . .	We cannot ship

---

lasche . . . As promptly as possible
lbank . . . As required
lbild . . . Faster
lblind . . . Without delay
ldunst . . . Advising by wire car number and initials
lfleck . . . Advising by mail car number and initials
lglanze . . . Tracing through to destination
lgrau . . . Until further advised
lgrund . . . During
lhut . . . . During next month
lkappe . . . During month after next
lkreis . . . During spring
lland . . . During summer
llos . . . . During fall
lloser . . . During winter
lluft . . . After navigation opens
lmeer . . . Within time promised
lmonat . . . In time named
lnacht . . . As soon as cars are placed
lreich . . . Balance of order
lring . . . Balance of order shortly
lsaum . . . Balance of order from stock
lsitz . . . Order No.
lstern . . . From stock
ltag . . . . Part from stock, making balance promptly
ltagen . . . Part from stock, making balance in two weeks
lthal . . . Part from stock, making balance in three weeks
ltrueb . . . Part from stock, making balance in four weeks
ltuch . . . Part from stock, making balance in five weeks
lvoll . . . A carload daily
lwind . . . Two carloads daily
lwolke . . . Three carloads daily
lzug . . . Four carloads daily

Shipments—Continued

lzuges . . . Five carloads daily
nab . . . . Six carloads daily
nachse . . . Seven carloads daily
nallee . . . Eight carloads daily
namtes . . Nine carloads daily
nan . . . . Ten carloads daily
narm . . . At present rate
narzt . . . Increasing present rate of shipment
nbahn . . . An increased quantity
nbaues . . . In one week
nding . . . In two weeks
nerbe . . . In three weeks
nfall . . . In four weeks
nfluss . . . In five weeks
nform . . . In six weeks
nfrage . . . In two months
ngang . . . In three months
ngeist . . . In four months
ngeld . . . In five months
nglied . . . In six months
ngott . . . In three months, about equal monthly proportions
ngut . . . In four months, about equal monthly proportions
ngutes . . . In five months, about equal monthly proportions
nhaus . . . In six months, about equal monthly proportions
nher . . . In seven months, about equal monthly proportions
nhilfe . . . In eight months, about equal monthly proportions
nhof . . . In nine months, about equal monthly proportions
nhofes . . . By rail
nidee . . . By vessel
njoch . . . By rail and water
nkanal . . . By next regular steamer
nkarte . . . From New York
nklang . . . From Philadelphia
nkraft . . . From Mobile
nkrone . . . From New Orleans
nlade . . . From Pensacola
nlaut . . . From Savannah
nlicht . . . From Addyston Works
nlinie . . . From Anniston Works

Shipments— Continued

nmagd . . . From Bessemer Works
nmauer . . From Buffalo Works
nmesse . . . From Burlington Works
nmond . . . From Chattanooga Works
nmotiv . . . From Cleveland Works
nofen . . . From Columbus Works
nort . . . From Louisville Works
npegel . . . From Scottdale Works
npfad . . . From Superior Works
nplatz . . . On account of car shortage, see letter
npreis . . . On account of labor troubles, see letter
npunkt . . On account of accidents, see letter
nquell . . . Without definite advices
nrad . . . Without formal order
nraum . . . By express
nrebe . . . By express to
nrohr . . . By freight collect
nrolle . . . By freight prepaid

Not to be used with stem words above

Nectabamus . Cash thirty days, New York funds
Nectabis . . Cash against documents, New York funds
Nectabitis . At what rate are you shipping
Nectabo . . Are you shipping at rate promised
Nectaire . . What portion of order has been shipped
Nectanabis . What portion of order has not been shipped
Nectandre . If you cannot ship at once, please telegraph us
Nectar . . . Send shipping instructions at once by mail
Nectarbron . Send shipping instructions at once by wire
Nectareous . Are sending shipping instructions to-day
Nectarial . . Have sent shipping instructions
Nectaribus . Will send shipping instructions shortly
Nectarines . Notify us when shipment is ready, and we will send shipping instructions
Nectarteug . Hold shipments until further advised
Nectenebin . Shipment went forward prior to receipt of order to hold
Necthebis . . By what route was shipment made
Nectiberes . Trace shipment by mail
Nectique . . Trace shipment by wire
Nectocalyx . We are tracing shipments

Invoices

Negabais	Refer to our invoice
Negabamos	Refer to your invoice
Negabelha	Send invoice
Negabilita	Send invoice to
Negabuntur	Send copy of invoice
Negacao	Send copy of invoice to
Negaceiro	Send invoices and bill of lading
Negaciones	Have received invoice
Negador	Have received invoice for
Negadores	Have not received invoice
Negalho	Have not received invoice for
Negandorum	Have sent invoice
Negandum	Have sent copy of invoice
Neganopeau	Invoice omitted from letter, mailed to-day
Negaramini	What is the amount of invoice
Negarian	The amount of invoice is

Time

Nege	Ultimo	**Neir**	Instant	**Nela**	Proximo
Nemi	January	**Nome**	May	**Nubi**	September
Neno	February	**Noni**	June	**Nuco**	October
Nepu	March	**Nopo**	July	**Nusa**	November
Nola	April	**Noru**	August	**Nute**	December

bas	1st	**nbogen**	12th	**nrolle**	22nd
boom	2nd	**nbuch**	13th	**nsatz**	23rd
boomen	3rd	**ndruck**	14th	**nstein**	24th
dly	4th	**nheft**	15th	**nstich**	25th
dness	5th	**nkopf**	16th	**remmo**	26th
dop	6th	**nlimin**	17th	**reste**	27th
doppen	7th	**nmappe**	18th	**ront**	28th
ering	8th	**nplan**	19th	**scendo**	29th
ful	9th	**npult**	20th	**schelp**	30th
kern	10th	**nrecht**	21st	**schil**	31st
nblatt	11th				

Amounts

Pach . . Tons of 2000 pounds **Pail** . . Pounds **Palm** . . Pieces
Pant . . Feet **Pard** . . Inches

aba 1	agogos 37	antry 73
aban 2	aient 38	ar 74
abas 3	aim 39	arada 75
abile 4	aire 40	areis 76
abitur 5	ait 41	arene 77
able 6	aje 42	aresci 78
abo 7	ajista 43	aretus 79
abunt 8	al 44	ariais 80
acana 9	ale 45	arian 81
acci 10	aleza 46	arigo 82
accio 11	alform 47	arla 83
aceous 12	alibus 48	aron 84
acino 13	alium 49	aroso 85
acion 14	alla 50	arpia 86
acite 15	alon 51	arpos 87
ack 16	as 52	artes 88
acles 17	amere 53	arum 89
aco 18	amina 54	ary 90
acosm 19	amos 55	asan 91
actyle 20	amus 56	asch 92
ada 21	anaio 57	asoy 93
adas 22	anaje 58	assi 94
adella 23	anal 59	asteis 95
ades 24	anas 60	asto 96
adica 25	anchin 61	asum 97
adilla 26	ando 62	atily 98
ador 27	andra 63	ation 99
adora 28	andum 64	atis 100
adres 29	anhar 65	ativo 105
adure 30	anite 66	atma 110
aflora 31	annes 67	atmis 115
agem 32	ano 68	atura 120
aggio 33	anoso 69	atwas 125
agog 34	ant 70	auz 130
agio 35	anted 71	ava 135
agogen 36	antina 72	avano 140

Amounts—Continued

avel	145	bique	834	buil	2400
avero	150	birne	875	bulis	2450
avoga	155	bis	900	bulum	2500
bahn	160	bitis	917	bundi	2550
bak	165	blaft	950	bunt	2600
ban	167	blase	959	bury	2650
bank	170	blau	1000	busy	2700
bant	175	ble	1050	buys	2750
bar	180	bling	1084	cal	2800
bare	185	bloed	1100	canda	2850
barin	190	blok	1150	cao	2900
baris	195	blume	1167	carpe	2950
base	200	bo	1200	cassi	3000
basic	209	boek	1250	cata	3100
bat	225	boend	1300	ceae	3200
batis	250	boet	1334	celle	3300
bau	275	bogen	1350	cico	3400
baues	300	bole	1400	cillo	3500
bauwd	325	bolon	1417	cina	3600
bavo	334	bolos	1450	cinis	3700
bawi	350	bolum	1500	cite	3800
baxu	375	bond	1584	cra	3900
baza	400	bonsd	1600	crane	4000
bebat	417	boom	1650	crat	4500
beden	425	boord	1667	cris	5000
beef	475	bor	1700	croma	6000
bein	500	borgd	1750	crum	7000
belos	525	brada	1800	cular	8000
belum	542	brand	1850	cule	9000
beukt	550	brejo	1900	eanu	10000
beule	575	brera	1950	ear	10500
beum	584	breuk	2000	eau	11000
bilas	600	brin	2050	edel	11500
biles	625	bris	2100	ede	12000
bilet	667	brita	2150	eiro	12500
bilum	700	bromd	2200	elha	13000
bimur	709	brose	2250	elle	13500
bimus	750	bruch	2300	em	14000
bios	800	bsis	2350	emus	14500

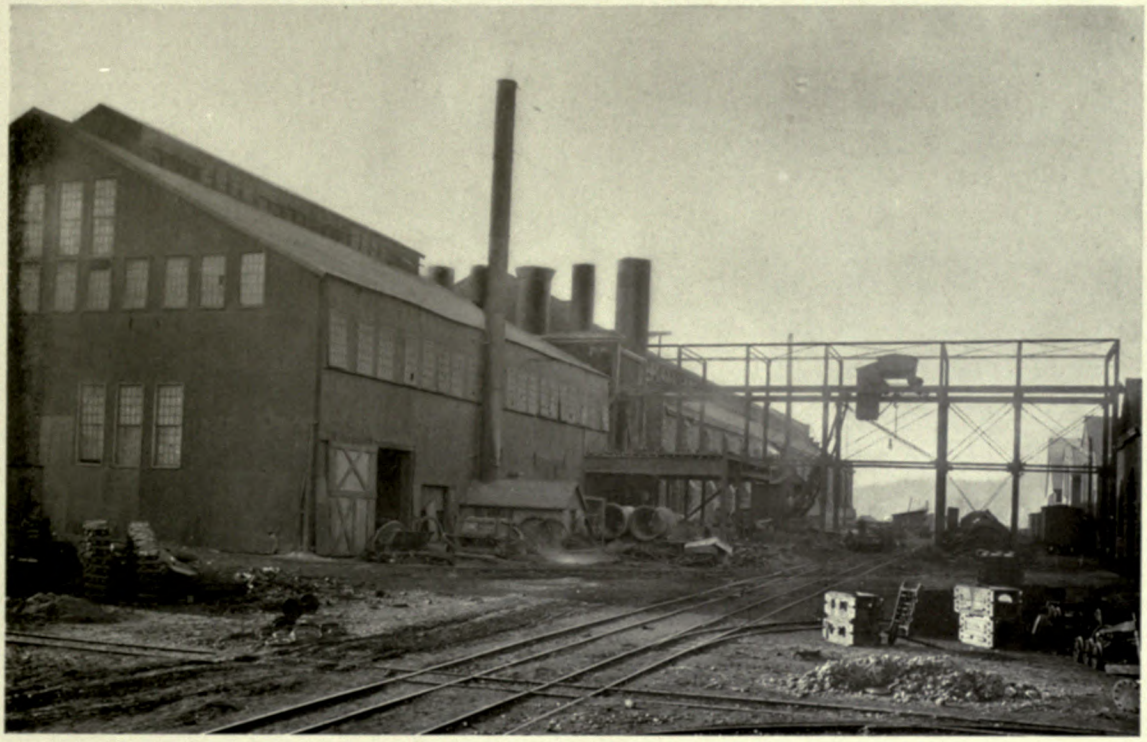
Amounts—Continued

enca 15000	**erga** 17500	**ers** 19500
enos 15500	**erie** 18000	**es** 20000
ensi 16000	**erly** 18500	**ette** 25000
eo 16500	**eroe** 19000	**eur** 30000
erem 17000		

Also to be used without above stem words

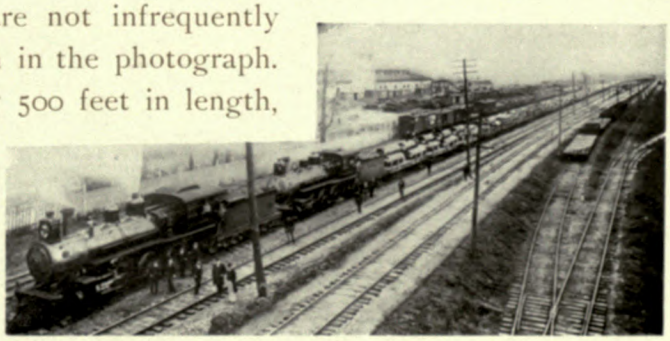
Parsley . . Per ton of 2000 pounds **Pathogenic** . . Per ton of 2240 pounds

(ADVERTISEMENT)



ADDYSTON, OHIO, WORKS

THE Addyston Works, of which partial views are given, are located about twelve miles west of Cincinnati, on the Ohio River, and on the lines of the "Big Four" and the B. & O. S. W. railways. The plant is one of the largest and most complete owned by the Company. Cast iron pipe in sizes 3 to 84 inches are made at these works, and the output figures to a large tonnage annually. Shipments of pipe are not infrequently made in train loads, as is shown in the photograph. The main pipe foundry is nearly 500 feet in length, the loam foundry nearly 400 feet and the jobbing foundry about 225 feet long, which is also the length of the power house. The plant is complete with ample pattern shop and



Train load of pipe from Addyston Works

(ADVERTISEMENT)

Addyston, Ohio, Works—End of Main Pipe Shop

storage, machine shop, cleaning, coating and testing facilities, and has been kept up to the most modern practice in pipe making. A complete laboratory makes it possible to check all material received and to carefully follow up the output.

Addyston Works—Cleaning Shed, Power House, Machine Shop, General and Loam Foundries

(ADVERTISEMENT)

ANNISTON, ALA., WORKS

THE Anniston Works are located on the outskirts of the city of Anniston, Ala., about one hundred and four miles west of Atlanta, and sixty-four miles east of Birmingham. The plant occupies a tract of about forty-five acres, and consists of a main foundry, something over five hundred feet in length by about ninty-five feet in width, and is complete with power house, machine shop, general special castings foundry, pattern shop and storage, cleaning, coating and testing sheds, laboratory, etc., and has ample trackage facilities which connect with the lines of the Southern Railway and of the Louisville & Nashville Railway. Pipe are now made at Anniston in sizes 4 to 36 inches diameter, and the plant is one of the largest owned by the Company in the South.

(ADVERTISEMENT)

BESSEMER, ALA., WORKS

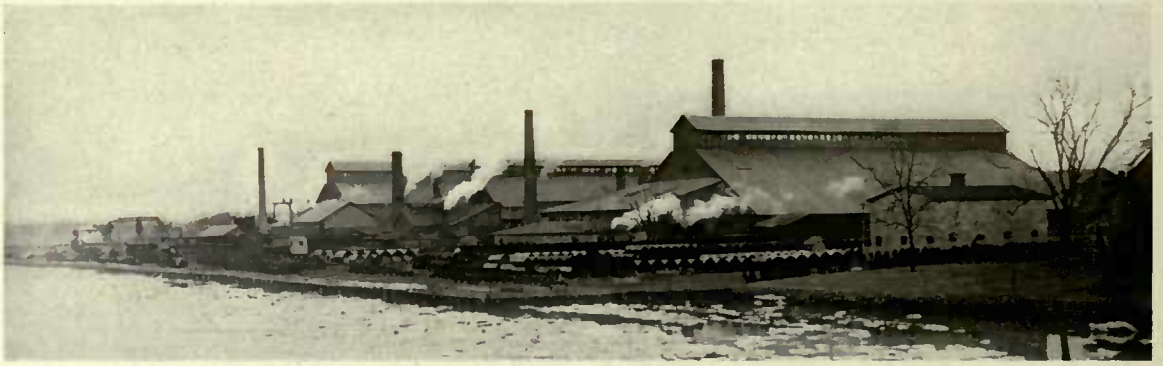
THE photograph shows a partial view of the main pipe and machine shops of the Bessemer Works, with the coke plant in the distance to the right, which, with the power house, large pipe yard, etc., occupy about seventy-five acres. The plant has some five and a half miles of standard gauge track and sidings, operated by the company's locomotives, and which are connected with the various railroads centering at Bessemer, affording excellent facilities for shipping. The main pipe shop is a building 410 feet long by 100 feet wide, in which are made pipe ranging from 4 to 72 inches in diameter. The plant includes a complete electric light and pumping station, etc., and in connection with the works there are numerous houses for employes, a hotel, etc., owned by the company. Improvements now (1906) in progress at Bessemer will materially increase our facilities at this plant.

(ADVERTISEMENT)

BUFFALO WORKS

THE above photograph is a view of the main pipe shop of the Buffalo Works, a building some 320 feet in length. The plant is located on the Belt Line of the New York Central & Hudson River R. R., through which connection is obtained with all railways centering at Buffalo. The works are complete with machine shop, pattern shop and storage, cleaning, coating and testing sheds, etc. At this plant pipe are made in sizes 4 to 54 inches, and the plant has recently been reconstructed and modernized, the new equipment including the machine ramming of pipe of the smaller sizes, the practice being similar to that followed at our Burlington Works. Power is obtained from Niagara Falls.

(ADVERTISEMENT)



BURLINGTON, N. J., WORKS (from Delaware River)

THE Burlington Works are located on the Delaware River, at East Burlington, about twenty miles above Philadelphia, and occupy about twenty-five acres out of a tract of some two hundred acres owned by the Company at East Burlington. The plant has facilities for the manufacture of cast iron pipe 3 to 60 inches in diameter, and for making loam and green sand special castings. The equipment for specials has been augmented by the recent addition of a new and modern jobbing foundry of steel construction.

A train load of 60-inch pipe leaving Burlington

The Burlington Works are thus also able to supply heavy loam castings with or without machining to the designs of engineers. Inquiries should be addressed to the company's nearest sales office. The works are connected with the Amboy division of the Pennsylvania Railroad, and being on tidewater,

(ADVERTISEMENT)

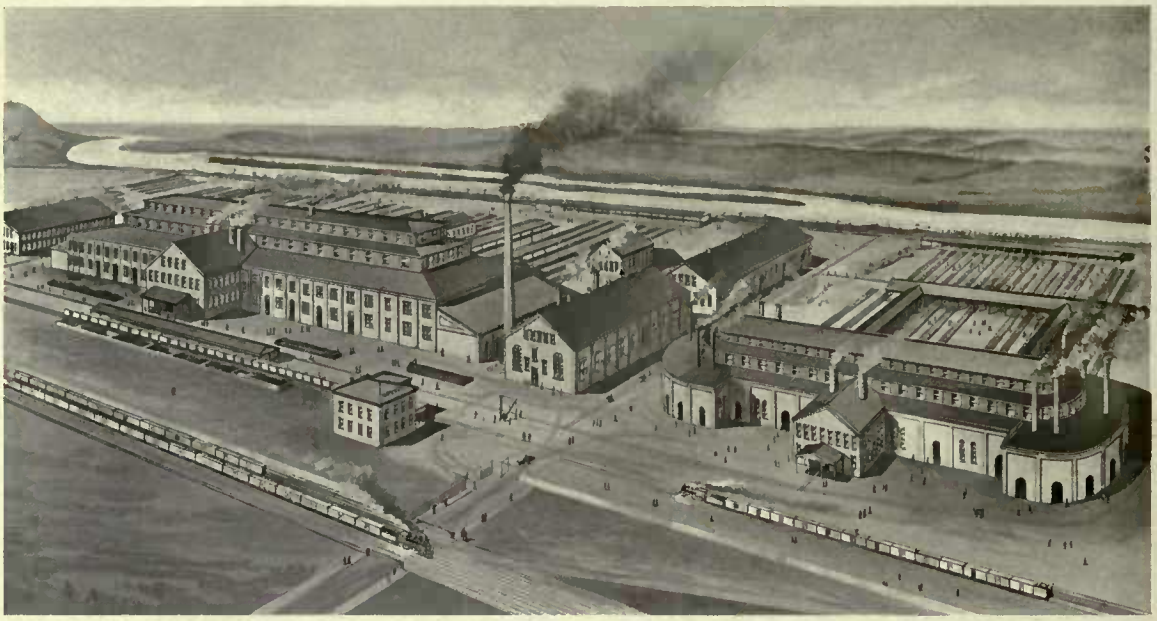
A glimpse of the Pipe Yard at Burlington, N. J., Works

have ample facilities for rail and water shipments, as well as for receiving of iron and other supplies, which are carefully checked in the laboratory, as is also the output. Cargo lots of cast iron pipe are frequently sent by sailing vessel to New England ports, while Philadelphia, Baltimore, New York and Hudson River points may be readily reached by barge or lighter.

Burlington Works, looking out Pearl Street, which divides Plant. New Jobbing Foundry is located beyond Machine Shop on the right

Vessel loading with Cast Iron Pipe at Burlington Works

(ADVERTISEMENT)

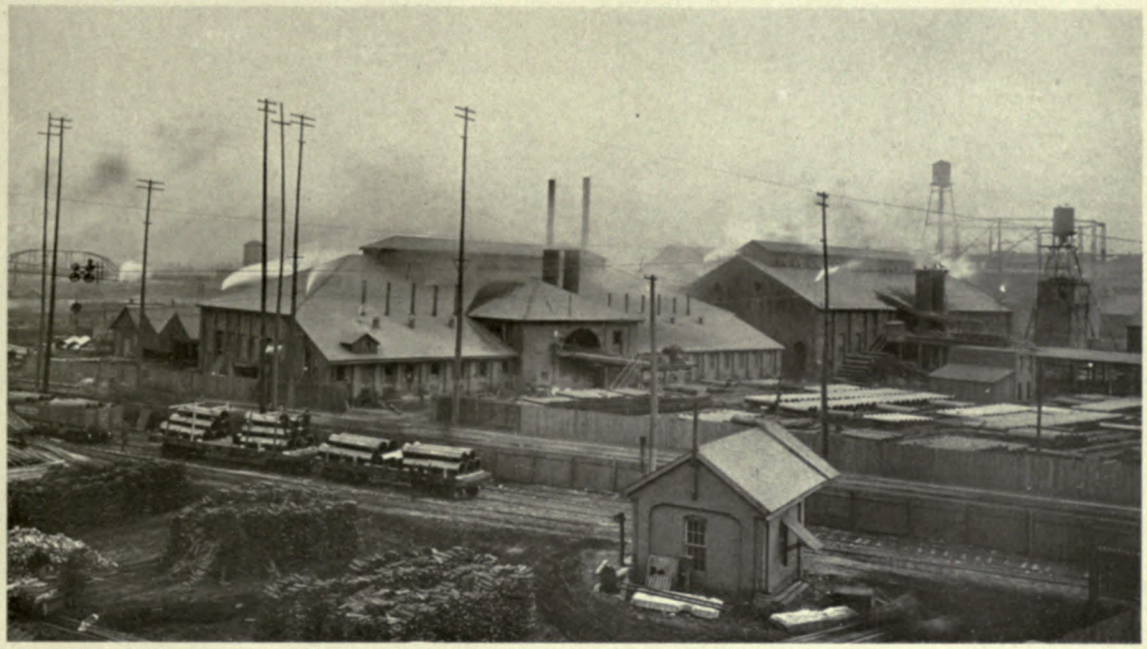


CHATTANOOGA, TENN., WORKS

THE above plate gives an excellent view of the Chattanooga plant, which consists of two pipe shops, the larger 472 feet long by 111 feet wide, and the smaller about 203 feet long by 81 feet wide, in which pipe are made in sizes ranging from 4 to 36 inches inclusive. The plant occupies something over thirty-one acres, and, as may be seen, is so located as to have excellent facilities for shipment via rail or river. The works are modern and well equipped, the cranes and machinery being electrically driven. Included in the plant are a substantial power house, machine shop, pattern shop, pattern storage, etc.

Rear View of part of Main Shop and Skids of Chattanooga Works

(ADVERTISEMENT)



LOUISVILLE, KY., WORKS

THE above photograph gives a view of a portion of the Fulton Street Plant, which is located between Preston, Jackson, Water and Fulton Streets, in the city of Louisville. In addition the "Ninth Street Plant" affords facilities for general foundry and special castings work. Both plants have ample facilities for rail shipments, either through lines connecting with the works or through a belt line with all the railways centering at Louisville. The works have facilities for making pipe of 3 to 60 inches diameter, and afford a large annual output.

(ADVERTISEMENT)

SCOTTDALE, PA., WORKS

THE Scottdale Works (and the Charlotte Furnace, owned by this Company) are located at Scottdale, Westmoreland County, Pennsylvania, a short distance north of Connellsville, and not far from Pittsburgh. Including the new pipe shop now (1906) building, which is 532 feet long by 100 feet wide, the works include three foundries, with power house, machine shop, pattern shop, rope house, etc., a complete plant for the manufacture of cast iron pipe from 3 to 60 inches diameter, inclusive. The plant, including pipe storage yard, occupies about fifty acres, and is connected up by something over three miles of standard gauge railroad tracks, over which cars are handled by our own locomotives. These tracks are connected with the Pennsylvania R. R. and the Baltimore & Ohio R. R., while the New York Central lines (Monongahela & Youghiogheny division) are easily reached. Thus the plant has excellent facilities for the shipment of its product.

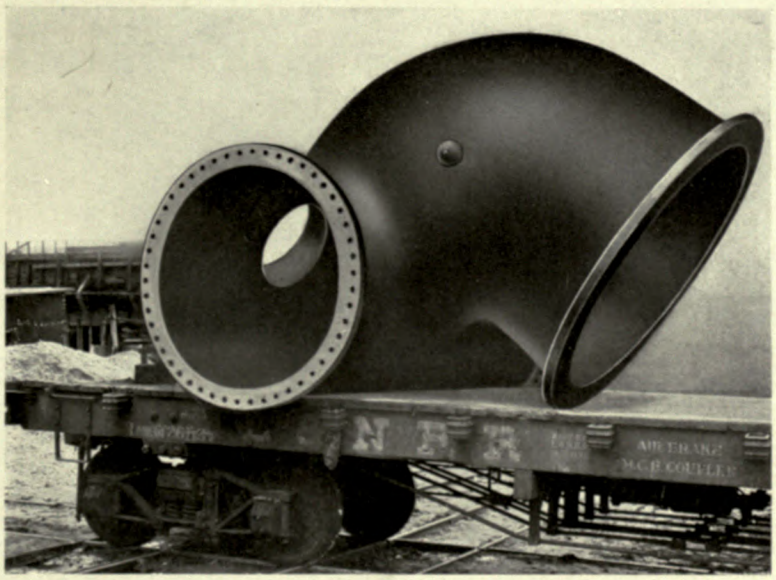
(ADVERTISEMENT)

STANDARD SPECIAL CASTINGS AND ODD SPECIALS

WHILE the exclusive use of standard specials in laying out work is most desirable, there are locations where it is not possible to do so for the entire work. We are prepared to supply to engineers' designs the heaviest and largest class of such odd castings.

The photographs show two examples of large special castings of this class, made at our Addyston Works to the designs submitted by purchasers.

60 x 60 x 48 x 36 inch Special Cross



60 x 60 x 30 x 84 inch Flanged Special Casting. Weight, 31,500 pounds

Our loam foundry and machine shop facilities are unequaled for meeting this demand; and when desired, we shall be pleased to submit sketches for large castings required for special locations.

(ADVERTISEMENT)

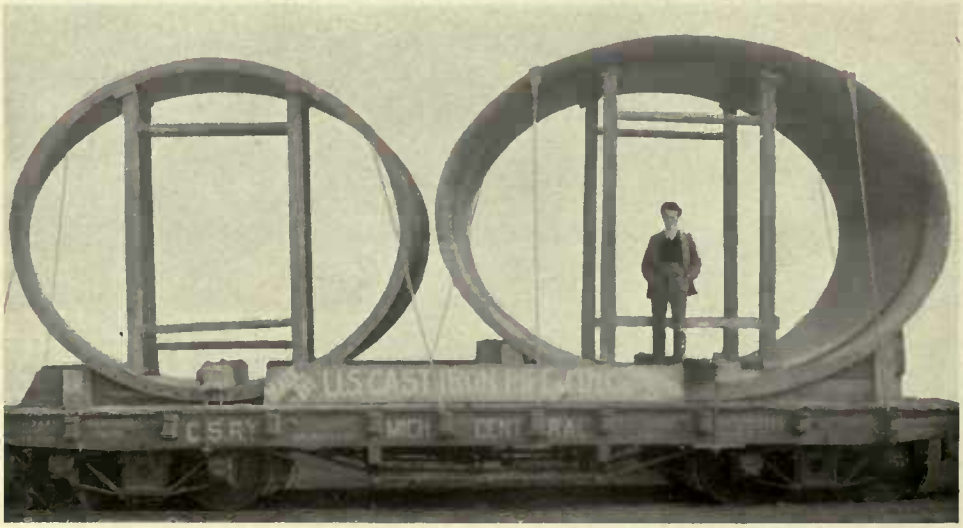
Cast Iron Pots and Pans

Cast Iron Stills and Kettles

Chemical House Castings

Sugar House Castings

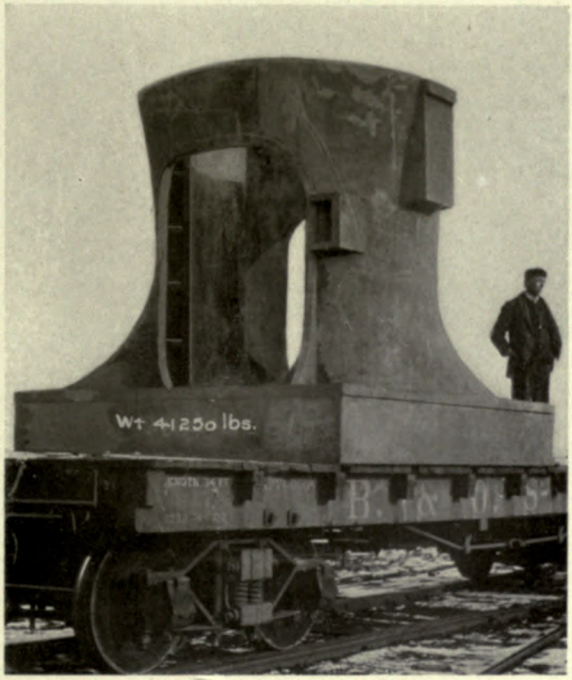
Bed Plate and Heavy Foundation Castings



Intake Castings

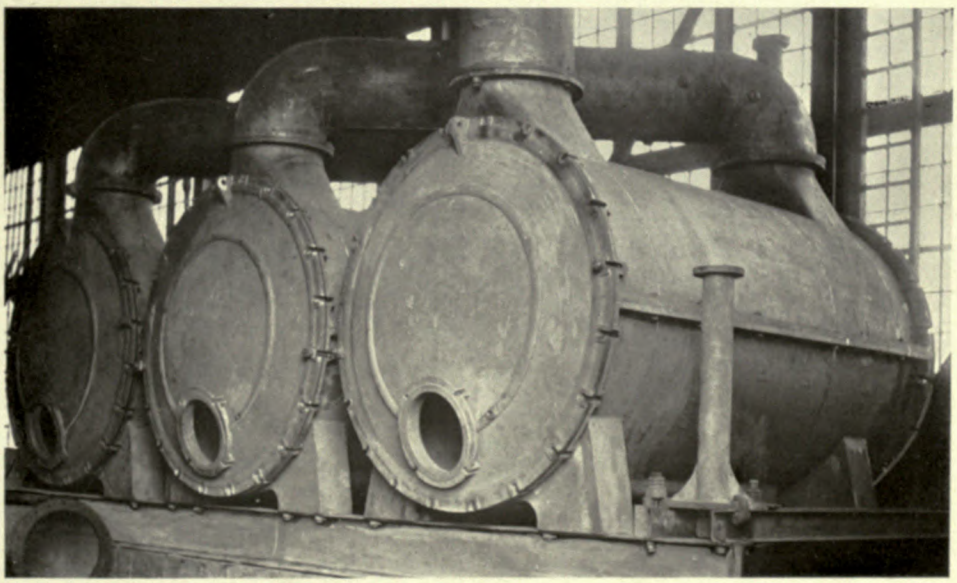
(ADVERTISEMENT)

Heavy Loam Castings for Engine and Pump Builders



Cast Iron Cylinders for Bridge Piers, Wells and Hydraulic Power

Cast Iron Piles for Marine Work. Columns



Heavy Machined Castings to Engineer's Designs

Index

	Page
Addyston, Ohio, Works	141, 142
Adjustable valve boxes	77
Advertisements	141–153
Air chambers	87
American Gas Light Association	21, 105
Amounts, code	138–140
Anniston, Ala., Works	143
Answers to inquiries—code	129, 130
Approximate weights	36, 105
Aqueducts	11
Base curves, B. & S. for water	54
" " flanged for water	87
Base tees, B. & S. for water	61–63
" " flanged for water	92, 93
" " high pressure, flanged	104
" " flanged for gas	118
Bessemer, Ala., Works	144
Bellmouth	78
Bell and spigot standards	18–21, 43–45, 106
Bends, B. & S. for water	52, 53
" B. S. for gas	107–109
" flanged for water	87–89
" flanged for gas	117
" high pressure, B. & S.	98
" high pressure, flanged	103
Blank flanges	96
Blow-off branches, B. & S.	66
" " " with manhole	67
Bored logs in Philadelphia	16
Branches, high pressure	99
Bridgeport, Ala., Works	5
Buffalo, N. Y., Works	145
Burlington, N. J., Works	146, 147
Bushings for gas	114
Capacity of cast iron pipe	120
" of cisterns	120
Caps for B. & S. water pipe	75
" for B. & S. gas pipe	109
Castings of iron	12
Cast iron pipe	9
" " in modern conduits and reservoirs	12
" " length of	17
" " life of	16
" " green vs. dry sand	17
Cast iron pipe vs. steel pipe	25
Cement joints	22
" " B. & S.	23
" " in winter	24
Chattanooga, Tenn., Works	148
Cleveland, Ohio, Works	5
Coal chutes	81
Code, general	127–140
Columbus, Ohio, Works	5
Columns	119
Concentric reducers	112
Condensed specials	79, 80
Contracts	5
Croton dam	12
Crosses and tees, B. & S. for water	55–60
" " B. & S. for gas	110, 111
" " flanged for water	90, 91
" " flanged for gas	118
Culverts and drains	31
Curve with bases, B. & S. for water	54
Curves, B. & S. for water	52, 53
" B. & S. for gas	107–109
" high pressure, B. & S.	98
" high pressure, flanged	103
" with full length B. & S. pipe	20, 21
Cylinders	86
Cylinder rolls	87
Description of pipe	36
Discharge of gas	125, 126
Drips	115
Dry vs. green sand pipe	17
Earliest pipe	9
Embankment materials	31
Expansion joints	97, 101
Feet, code	138–140
Fish trap	78
Flange pipe for water	82
" " short length, double flange for water	83
" " short length, bell and flange for water	84
" " short length, flange and spigot for water	85
" " high pressure	102
" " tongue and groove	102
" " tongue and recess	102

Index—Continued

	Page
Flange pipe for gas	116
" " for gas, short lengths	116
Flanged special castings for water	87–97
Flexible joint pipe	47, 48
Flume gate	78
Frictional heads in pipe	121, 122
" " in elbows	123
Foreign inquiries	5
" shipments	5
Gas mains with cement joints	22
" " with lead joints	22
" " with turned and bored joints	25
Gas pipe standard	105, 106
Gate house and reservoir connections	13
Hand-hold, bends with	117
Hat flanges for gas	114
High vs. low pressure gas mains	24
High pressure pipe	45, 46
" " specials	98–104
" " fire systems	27
Holder drips	115
Hub sleeves for gas	113
Hydraulic cylinders	86
" power mains	30
Increasers for gas, S. & B.	112
" high pressure	100
" spigot and bell for water	68–73
" S. & B., long length for water	70–73
Independent high pressure fire systems	27
Inquiries, code	127, 128
" answers to code	129, 130
Intake lines	35
Intermediate weights, pipe	36, 37
Invoices, code	137
Iron and other metals	9
Joints, leakage	20
" B. & S.	19
" turned and bored	19
Lead pipe	11
" in pipe joints	49
" joints	22
Leakage at joints	20
Lengths, code	138–140
Letters, code	132
Life of pipe	16
Line drips	115
Louisville, Ky., Works	149
Lugs	51
Manhole heads and covers	77
Manifold, flanged	97
Modern conduits	12
Motion of gas in pipe	124
Newport, Ky., Works	5
Numbers, code	138–140
Offsets	53, 95
Orders, code	133
Philadelphia pipe lines	15, 28
Pieces, code	138–140
Plugs for B. & S. water pipe	76
" B. & S. gas pipe	114
" gas tapping	115
Plugs, screw	119
Puddle collars	78
Reducers, B. & S. for water	68–73
" eccentric B. & S. for gas	112
" concentric B. & S. for gas	112
" B. & S., long length	70–73
" flanged for water	94, 95
" flanged for gas	117
" high pressure, B. & S.	100
" high pressure, flanged	103
" return bends, flanged	97
Scottdale, Pa., Works	150
Screen pot	78
Screw flanges	96
" plugs	119
Service sleeve for gas	113
Sewers	31
Shipments, code	134–136
Siphon, Rosemary	14
Sleeves, standard for gas	113
" standard for water pipe	74
" high pressure pipe	98
Smoke flue	81
Solid sleeves for gas	113
Special castings, and standard special	151
" " for high pressure service	98–104
SPECIFICATIONS, STANDARD	36–41
Allowable variation in diameter of pipe and sockets	37

Index—Continued

	Page
SPECIFICATIONS, STANDARD—Continued	
Allowable variation in thickness	37
Allowable percentage of variation in weight	38
Casting of pipe	39
Castings to be delivered sound and perfect	41
Cleaning and inspection	39
Coating of pipe	39
Contractor to furnish men and materials	40
Cutting defective spigots	37
"Engineer," definition of word	41
General dimensions of pipe, Tables Nos. 1 and 3	43–45
Hydrostatic test	40
Inspector to report	41
Marking pipe	38
Power of engineer to inspect	40
Quality of castings	39
Quality of iron	38
Special castings	37
Testing materials	39
Split sleeves for gas	113
" " with and without branch outlet for water	97
Standard thickness and weights of pipe	43–46
" flexible joint pipe, Tables 5 and 6	47, 48
" gas pipe and special castings	105–118
" pipe and specials for gas	21
" special castings for water	50–76
Steel pipe	25, 26
Submerged pipe	32
Superior, Wis., Works	5
Taper joint pipe	33
Tapping, alternate for drip plugs	115
Tee bases, B. & S. for water	61–63
" " flanged for water	92, 93
" " flanged for gas	118
" " high pressure, flanged	104
Tees and crosses, B. & S. for water	55–60
" " flanged for water	90, 91
Tees and crosses, B. & S. for gas	110, 111
" " flanged for gas	118
" " high pressure, flanged	104
Tees, high pressure, B. & S.	99
" with flanged branch	101
Telegrams	131
Terms, code	136
Tidal gate	78
Time, code	137
Tongue and groove, flange joint	102
" " recess, flange joint	102
Tons, code	138–140
Tons, feet, lengths, code	138–140
Valve boxes, adjustable	77
Wachusett dam	13
Water supply conduits	10
Works	5
Y branches, B. & S. for water	64, 65
" all hub, for gas	111
" high pressure, flanged	104
Yard drips	115

LIBRARY OF THE UNIVERSITY OF CALIFORNIA

Chasmar-Winchell Press New York and Pittsburgh

THIS BOOK IS DUE ON THE LAST DATE STAMPED BELOW

AN INITIAL FINE OF 25 CENTS
WILL BE ASSESSED FOR FAILURE TO RETURN THIS BOOK ON THE DATE DUE. THE PENALTY WILL INCREASE TO 50 CENTS ON THE FOURTH DAY AND TO $1.00 ON THE SEVENTH DAY OVERDUE.

FEB 21 1941
MAR 30 1943
OCT 9 1953 LU
4 Jan'69TD
REC'D LD
JAN 2 1963

LD 21-100m-7,'39(402s)

YE 18025

TD491
U5
United
160058